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NATIONAL SHELLFISH SANITATION PROGRAM MANUAL OF OPERATIONS. PART II. SANITATION OF THE HARVESTING AND PROCESSING OF SHELLFISH, 1965 REVISION

Eugene T. Jensen

Public Health Service
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National Shellfish Sanitation Program
Manual of Operations

Part II

SANITATION of the HARVESTING and PROCESSING of SHELLFISH

1965 Revision

Compiled and edited by
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U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
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1925. Supplement No. 53 to Public Health Reports, November 6, 1925 "Report of Committee on Sanitary Control of the Shellfish Industry in the United States".

1937. United States Public Health Service Minimum Requirements for Approval of State Shellfish Control Measures and Certification for Shippers in Interstate Commerce. (Revised October 1937)

1946. Manual of Recommended Practice for Sanitary Control of the Shellfish Industry Recommended by the U.S. Public Health Service (Public Health Bulletin No. 295).

1957. Manual of Recommended Practice for Sanitary Control of the Shellfish Industry Part II: Sanitation of the Harvesting and Processing of Shellfish. (Printed as Part II of Public Health Service Publication No. 33.)

1959. Manual of Recommended Practice for Sanitary Control of the Shellfish Industry Part I: Sanitation of Shellfish Growing Areas. (Printed as Part I of Public Health Service Publication No. 33.)

1962. Cooperative Program for the Certification of Interstate Shellfish Shippers, Part II, Sanitation of the Harvesting and Processing of Shellfish. (Printed as Part II of Public Health Service Publication No. 33.)

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Foreword

A DECLARATION OF PRINCIPLES

The National Shellfish Sanitation Program is an unusual teaming of State and Federal resources to preserve and manage a natural resource for a beneficial use. Although the current program is of comparatively recent origin, its development can be traced back through several centuries of American history. When the European colonists arrived they found almost unimagined natural wealth. Forest, rich agricultural land, minerals and space itself were present in quantities and a variety previously unknown. To these settlers one of the most valuable and readily usable of these natural resources was the food resources of the sea, particularly the estuaries. It is not surprising that shellfish were foremost among their staple food items.

The value of these renewable natural resources to the early settlers was reflected in colonial legislation designed to encourage their wise use. In 1658—over 300 years ago—the Dutch council of New Amsterdam passed an ordinance regulating the taking of oysters from the East River. Other early legislation, including that of New York (1715), New Jersey (1730), and Rhode Island (1734), was designed to regulate harvesting, presumably as conservative measures to guarantee a continuing supply.

The public health problems which were associated with shellfish in the United States in the first two decades of the present century brought a new dimension to natural resource utilization; i.e., shellfish could not be used for food unless of acceptable sanitary quality. This concept was clearly recognized in the PHS-sponsored conference of 1925 in which the concepts of the present cooperative program were first outlined and the administrative foundation put down. All parties seemed to recognize, and accept as fact, the premises that: (1) shellfish represented a valuable natural food resource; (2) the cultivation, harvesting, and marketing of this food resource were valuable components in the financial bases of many coastal communities; (3) a State and Federal program was necessary to permit the safe use of this resource; and (4) the transmission of disease by shellfish was preventable and therefore not to be tolerated. It is significant that the founders of this program did not take the parochial stand that the only completely safe way to prevent disease transmission by shellfish was to prohibit its use. Instead, they held that this beneficial use of the estuaries was in the best public interest, and that sanitary control should be developed and maintained which would allow safe use. These concepts were recognized in the program which evolved following the report of the "Committee on Sanitary Control of the Shellfish Industry in the United States" in 1925.

In 1954 the Surgeon General of the U.S. Public Health Service called a second national conference to discuss shellfish sanitation problems. Specifically, the 1954 conference addressed itself to the questions of the practicality and need for this tripartite program. There was general agreement that, despite the profusion of technical problems, the basic concepts were sound and that it was in the public interest to maintain the program. Thus, the presence of an irrevocable bond between the application of sanitary controls in the shellfish industry and the continuing beneficial use of a renewable natural resource was again confirmed.

Despite this long-established relationship, the national program has tended to neglect the second of these biphasic goals—use of a valuable natural resource—and to concentrate on the negative policy of closure of areas of unsuitable sanitary quality. Little effort has been made by the program to develop a compensatory element which would encourage corrective action by State or Federal agencies. Similarly, the pro-

gram has not taken a position on the use of conservation law even when it was known that this would increase the programs consumer protection confidence factor.

In recognition of past history of the shellfish industry in the United States and of the relationship of the National Shellfish Sanitation Program to the effective use of this natural resource, the 1964 Shellfish Sanitation Workshop endorses the following principles:

1. Shellfish are a renewable, manageable natural resource of significant economical value to many coastal communities, and which should be managed as carefully as are other natural resources such as forest, water, and agricultural lands.
2. Shellfish culture and harvesting represents a beneficial use of water in the estuaries. This use should be recognized by State and Federal agencies in planning and carrying out pollution prevention and abatement programs and in comprehensive planning for the use of these areas.
3. The goals of the National Shellfish Sanitation Program are: (1) the continued safe use of this natural resource, and (2) active encouragement of water quality programs which will preserve all possible coastal areas for this beneficial use.

It is the conviction of the 1964 National Shellfish Sanitation Workshop that survival of the shellfish industry is in the best public interest; that by application of the above principles on a State-by-State basis, shellfish can continue to be used safely as food and to make a valuable contribution to the economic structure of the Nation both in the immediate present and in the foreseeable future.

Introduction

In 1925 State and local health authorities and representatives of the shellfish industry requested the Public Health Service to exercise supervision over the sanitary quality of shellfish shipped in interstate commerce. In accordance with this request, a cooperative control procedure was developed. In carrying out this cooperative control, the States, the shellfish industry, and the Public Health Service each accept responsibility for certain procedures as follows:

1. Procedures To Be Followed by the State.—Each shellfish-shipping State adopts adequate laws and regulations for sanitary control of the shellfish industry, makes sanitary and bacteriological surveys of growing areas, delineates and patrols restricted areas, inspects shellfish plants, and conducts such additional inspections, laboratory investigations, and control measures as may be necessary to insure that the shellfish reaching the consumer have been grown, harvested, and processed in a sanitary manner. The State annually issues numbered certificates to shellfish dealers who comply with the agreed-upon sanitary standards, and forwards copies of the interstate certificates to the Public Health Service.

2. Procedures To Be Followed by the Public Health Service.—The Public Health Service makes an annual review of each State's control program including the inspection of a representative number of shellfish-processing plants. On the basis of the information thus obtained, the Public Health Service either endorses or withholds endorsement of the respective State control programs. For the information of health authorities and others concerned, the Public Health Service publishes a semimonthly list of all valid interstate shellfish-shipper certificates issued by the State shellfish-control authorities.

3. Procedures To Be Followed by the Industry.—The shellfish industry cooperates by obtaining shellfish from safe sources, by providing plants which meet the agreed-upon sanitary standards, by maintaining sanitary plant conditions, by placing the proper certificate number on each package of shellfish, and by keeping and making available to the control authorities records which show the origin and disposition of all shellfish.

The fundamental components of this National Shellfish Sanitation program were first described in a *Supplement to Public Health Reports*, "Report of Committee on Sanitary Control of the Shellfish Industry in the United States" (1925). This guide for sanitary control of the shellfish industry was revised and reissued in 1937 and again in 1946. It was separated into two parts by publication of Part II, Sanitation of the Harvesting and Processing of Shellfish in 1957 and by publication in 1959, of Part I, Sanitation of Shellfish Growing Areas. The need for a specialized program of this nature was reaffirmed at the National Conference on Shellfish Sanitation held in Washington, D.C., in 1954 (*1*) and at the Shellfish Sanitation Workshops held in 1956 (*2*), 1958 (*3*), 1961 (*67*), and 1964 (*68*).

This addition of the shellfish sanitation manual has been prepared in cooperation with the State shellfish control authorities in all coastal States, food control authorities in the inland States, interested Federal agencies, Canadian Federal departments, the Oyster Institute of North America, the Pacific Coast Oyster Growers Association, and the Oyster Growers & Dealers Association of North America.

Since the growing and processing of shellfish are two distinct phases of operation in the shellfish industry, the manual has been prepared in two parts: I: Sanitation of Shellfish-Growing Areas; and II: Sanitation of the Harvesting and Processing of Shellfish. This Part II of the manual is intended as a guide for the preparation of State shellfish sanitation laws and regulations, for sanitary control of

the harvesting and processing of shellfish, and for the shellfish industry in the maintenance of sanitary conditions during the harvesting and processing of shellfish. It is intended that States participating in the National Shellfish Sanitation program for the certification of interstate shellfish shippers will be guided by this manual in exercising sanitary supervision over harvesting, shucking, packing, repacking, and reshipping shellfish, and in the issuing of certificates to shellfish shippers.

The manual will also be used by the Public Health Service in evaluating State shellfish sanitation programs to determine if the programs qualify for endorsement. Part III of the Manual, "Public Health Service Appraisal of State Shellfish Sanitation Programs," sets forth appraisal procedures in evaluating State shellfish sanitation programs and is based on the requirements contained in parts I and II.

The provisions of this manual were accepted at the Shellfish Sanitation Workshop held in Washington, D.C., November 17–19, 1964, and unless otherwise stated become effective 60 days after publication (*68*).

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Chief, Shellfish Sanitation Branch, Division of Environmental Engineering and Food Protection, Public Health Service.

Definitions

And/or.—Where this term is used, *and* shall apply where possible; otherwise, *or* shall apply.

Approved area.—An area which has been approved by the State control agencies for growing and/or harvesting of shellfish for direct marketing.

Classes of shippers.—(a) *Reshippers* are shippers who transship shucked stock in original containers, or shell stock, from certified shellfish shippers to other dealers or to final consumers. (Reshippers are not authorized to shuck or repack shellfish.)

(b) *Repackers* are shippers, other than the original shucker, who pack shucked shellfish into containers for delivery to the consumer. Shippers classified as repackers may shuck shellfish if they have the necessary facilities. A repacker may also act as a shell-stock shipper if he has the necessary facilities.

(c) *Shell-stock shippers* are shippers who grow, harvest, buy, and/or sell shell stock. They are not authorized to shuck shellfish nor to repack shucked shellfish.

(d) *Shucker-packers* are shippers who shuck and pack shellfish. A shucker-packer may act as a shell-stock dealer. (Shucker-packers are classified as repackers if shucked shellfish are *regularly* repacked.)

Dry storage.—The storage of shell stock out of water.

Food-product zone.—The parts of food equipment, including auxiliary equipment (such as blower pipes and drain valves), which may be in contact with the food being processed, or which may drain into the portion of equipment with which food is in contact.

Internal temperature.—Actual temperature of shucked shellfish in the container, as opposed to the air temperature of the refrigerator in which the shellfish may be stored.

Person.—Person shall mean an individual, or a firm, partnership, company, corporation, trustee, association, or any public or private entity.

Shellfish.—All edible species of oysters, clams, or mussels, either shucked or in the shell, fresh or frozen.

Shell-stock.—Shellfish which remain in their shells.

Shucked shellfish.—Shellfish, or parts thereof, which have been removed from their shells.

Wet storage.—The temporary storage of shellfish from approved sources, intended for marketing, in tanks containing sea water or in natural bodies of water, and including storage in floats.

Section A

HARVESTING AND HANDLING SHELL-STOCK

1. Boats and Trucks.—All boats used in tonging, dredging, or transporting shellfish, including "buy" boats, and all trucks used for hauling bulk shell-stock shall be so constructed, operated, and maintained as to prevent contamination or deterioration of the shellfish, and shall be kept clean.

Public-health explanation.—Precautions exercised in gathering shellfish from approved growing areas may be nullified by contamination with bilge water or polluted overboard water.

Satisfactory compliance.—This item will be satisfied when—

a. Decks and/or storage bins are so constructed and located as to prevent bilge water or polluted overboard water from coming into contact with the shellfish. Removable false bottoms will ordinarily be required in all small craft, including rowboats, skiffs, and power boats, used in the transport of shell-stock.

b. Bilge pumps are so located that pumpage will not contaminate shellfish.

c. Sacks or other containers used for the storage of shellfish are clean.

d. Boat decks and storage bins are kept clean with water from an approved source.

e. That portion of boats or trucks (decks, storage bins, floorbeds, etc.) and all other equipment (shovels, wheelbarrows, rakes, etc.) in contact with shell-stock during handling or transport from polluted areas to approved areas for relaying are thoroughly cleaned before they are used for the transport or handling of shellfish from approved areas.

f. Trucks used for the transport of bulk shell stock are so constructed as to protect the shellfish from contamination, and are kept clean.

2. Washing of Shell-Stock. Shell-stock should be washed reasonably free of bottom sediments and detritus as soon after harvesting as is practicable. The primary responsibility for washing rests with the harvester. Water used for shell-stock washing should be obtained from an approved growing area, or from other sources approved by the State regulatory agency.

Public-health explanation.—When muddy shell stock are shucked, quantities of mud and bacteria are mixed with the shucked shellfish, thereby contributing to high bacteria counts in the finished product.

These bacteriological changes which take place during the shucking of oysters (*Crassostrea virginica*) in the Middle Atlantic States have been investigated at the Public Health Service's Shellfish Sanitation Laboratory (Kelly and Arcisz: "Bacteriological Control of Oysters During Processing and Marketing," *Public Health Reports*, vol. 69, No. 8, August 1954).

During shucking, the percentage of samples of oysters having coliform Most Probable Numbers (MPN's) in excess of 2,400 per 100 ml. of meats was found to increase from 18 to 72, and the percentage of samples of oysters having coliform MPN's in excess of 24,000 per 100 ml. of meat increased from zero to 14. Mud and detritus adhering to the shells were implicated as responsible for the increase in coliform counts.

Muddy shell-stock also make it difficult to maintain shucking rooms in a clean, sanitary condition.

Water used for shell-stock washing should be of good sanitary quality, to avoid possible contamination of the shell stock.

Satisfactory compliance.—This item will be satisfied when—

a. Shell-stock are washed reasonably free of bottom sediments and detritus as soon after harvesting as is feasible. Washing of naturally clean shell stock is not necessary. Shell-stock

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should preferably be washed at the time of harvesting; however, this may not always be feasible because of the harvesting method or climatic conditions. In other instances, shell-stock washing by the harvester might introduce a sanitary hazard because of the possible tendency of the harvester to wash the shell-stock with polluted water from a harbor area, rather than with clean water from a growing area. State shellfish control authorities may, therefore, at their discretion, waive the requirement for shell-stock washing by the harvester when, in the State's opinion, there are climatic, technical, or sanitary reasons for such action.

b. Water used for washing shell-stock is obtained from an approved growing area, or from other sources approved by the State regulatory authority.

3. Disposal of Body Wastes.—During the marketing season, body wastes shall not be discharged overboard from a boat used in the harvesting of shellfish, or from "buy" boats while in areas from which shellfish are being harvested. The State shellfish control agency, when necessary, shall specify the device and practices necessary to eliminate the overboard discharge of body wastes from boats used in harvesting of shellfish. It is recommended that each State shellfish control agency maintain an educational program for all boat owners concerning the public health significance and dangers inherent in the overboard discharge of body wastes.

Public-health explanation.—Gastrointestinal infections may be conveyed by shellfish; hence, it is necessary to protect the shellfish from pollution by disease-causing organisms that may be present in body wastes. This item is intended to protect the shellfish from chance pollution during harvesting. The discharging of body wastes from either harvesting or "buy" boats will be considered in the evaluation of harvesting practices.

Satisfactory compliance.—This item will be satisfied when—

a. No body wastes are discharged from a boat used in harvesting shellfish while in an area from which shellfish are being harvested.

b. No body wastes are discharged from a "buy" boat while in an area in which shellfish are being harvested.

c. It is evident that soil cans, if provided, are used for the purpose intended.

d. Soil cans, where used, are so secured and located as to prevent contamination of the shellfish by spillage or leakage.

e. The contents of soil cans are disposed of by discharge into an approved sewage-disposal system, and soil cans are cleaned before being returned to the boat.[1] (Facilities used for cleaning food-processing equipment may not be used for this purpose.)

4. Licenses for Commercial Harvesters.—Each person who handles unshucked shellfish prior to delivery or sale to a dealer certified under the cooperative program shall have a valid State permit or license to do so.

In the case of leased land, either the lessee shall be licensed or the person who harvests shall be licensed by the State. The State agency having primary responsibility for granting licenses shall maintain a record of all such licenses granted for review by the appropriate Public Health Service regional office.

Satisfactory compliance.—This item will be satisfied when—

a. Each person harvesting shellfish has a valid permit or license to do so.

b. The State agency having responsibility for granting licenses maintains a record of all such licenses granted for review by the appropriate Public Health Service regional office.

c. In the case of leased growing area(s), either the lessee or the person who harvests shall be licensed by the State.

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[1] For use and construction of soil-can-washing facilities, see Public Health Service Publication No. 66, *Handbook on Sanitation of Railroad Servicing Areas*, on sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C., 20402, at 20 cents.

Section B

SHUCKING AND PACKING SHELLFISH

1. Wet Storage.—Shellfish in wet storage shall be protected against sewage contamination. Wet storage shall not be practiced by a shipper unless written approval is given each year by the State regulatory authority. This approval is to include a sketch, drawn to scale, showing the approved location of the storage area, floats or the water intake for the wet-storage tanks, and all the potential hazards to which the stored shellfish may be exposed. The approval statement shall describe the measures taken to protect the shellfish from the potential hazards. The presence of usable wet-storage tanks in a plant, or the presence of usable floats in the water, shall be deemed evidence that wet storage is being practiced.

Public-health explanation.—Removal of shellfish from growing beds to storage areas close to shore and habitations, and frequently in shallow water, may subject an accumulated quantity of shellfish to constant or intermittent pollution. Shellfish in wet-storage tanks are similarly subject to pollution if the water is obtained from a polluted source. Shellfish on floats are more directly exposed to chance contamination from boats than are shellfish stored in the growing areas themselves, since it is customary to "float" the shellfish near the surface, where fresh sewage is apt to be found in greatest concentration. Shellfish on floats, therefore, are protected to a less degree by dilution than are shellfish on bottom areas.

Satisfactory compliance.—This item will be satisfied when—

a. Shellfish in wet storage are protected against sewage contamination.

b. Wet storage is practiced only in strict compliance with the terms of the written approval of the State regulatory authority. This approval is to include: (1) a sketch, drawn to scale, showing the location of the storage area or water intakes and the potential hazards to which the shellfish may be exposed; and (2) a statement describing the measures taken to protect the shellfish from the above potential hazards. This written approval shall be valid for not more than 12 months.

2. Plant Arrangement.—Plants in which shellfish are shucked and packed shall, to the extent feasible, be so located that they will not be subject to flooding by high tides. If plant floors become flooded, shucking shall be discontinued until after waters have receded and the building cleaned.

Shucking and packing operations shall be conducted in separate rooms. A shucked-stock delivery window shall be installed in the partition between the two rooms. Packing rooms shall be of sufficient size to permit sanitary handling of the product and thorough cleaning of equipment.

A separate room or rooms, or lockers, shall be provided for storing employees' street clothing, aprons, gloves, and personal articles.

Public-health explanation.—The nature of the shucking operation is such that the shuckers' clothing becomes very soiled. If shuckers enter the packing room, shucked stock, cans, and other equipment may become contaminated. Rooms or lockers should be provided for clothing, aprons, and gloves to eliminate the tendency to store such articles on the shucking benches or in packing rooms, where they interfere with plant cleanup and operation.

Satisfactory compliance.—This item will be satisfied when—

a. Processing establishments are so located that they will not be subject to flooding by ordinary high tides. (A minimum plant elevation of at least 2 feet above high tides is recommended.) If plant floors are flooded, shucking is discontinued until after waters have receded and the building is cleaned.

b. Shucking and packing operations are

carried on in separate rooms. Flytight screening may be accepted in lieu of a solid wall between the shucking and packing rooms, provided that the packing room is so situated that there is no likelihood of the shucked product or packing-room equipment being contaminated by splash from the opening room.

c. The delivery window is equipped with a corrosion-resistant shelf of metal, concrete, or tile, draining toward the shucking room and, if necessary, curbed on the packing-room side.

d. Packing rooms are large enough to permit sanitary handling of shellfish and thorough cleaning of equipment.

e. Rooms or lockers are provided which have adequate capacity for storing clothing, aprons, gloves, and other personal articles of employees.

3. Dry Storage of Shell-Stock.—Shell-stock in dry storage shall be protected from contamination. Rooms, benches, or hoppers shall be provided for the storage of shell-stock. Floor wastes from a shell-stock storage area shall be discharged through a separate drainage system, or, if discharged into a general drainage system carrying sanitary wastes, an airgap shall be provided.

Public-health explanation.—Smooth, wash-stored where polluted ground or surface water or floor drainage can accumulate, the shell-stock may become contaminated. Shell-stock may also be contaminated by domestic animals and rodents (see Section B, Items 12 and 15).

Satisfactory compliance.—This item will be satisfied when—

a. The storage-area floor is constructed of material impervious to water, is free from cracks and uneven surfaces that interfere with proper cleaning or drainage, and is graded to assure complete and rapid drainage of water away from the shellfish.

b. Walls of shell-stock storage rooms and hoppers are smooth and of material which will not deteriorate under repeated washing.

c. Shell-stock storage areas are so constructed that they will not receive floor drainage water from other portions of the plant. If such construction is not feasible, the shell-stock should be stored on racks to prevent them from coming into contact with the floor or with water which might accumulate on the floor. Shell-stock storage areas should not serve as an entry way to other areas of the establishment. Shell-stock storage areas are protected against sewage backflow by the installation of an airgap in the waste line or by provision of a separate drain system.

d. Conveyances or devices used in the transport of shell-stock are so constructed that they may be easily cleaned and are kept reasonably clean. (Use of impervious materials is recommended wherever possible.)

4. Floors.—Floors shall be constructed of concrete or other material impervious to water, and shall be graded to drain quickly, shall be free from cracks and uneven surfaces that interfere with proper cleaning or drainage, and shall be maintained in good condition.

Public-health explanation.—Properly graded floors, of durable, impervious material, maintained in good condition, permit rapid disposal of liquid and solid wastes, and are easily cleaned.

Satisfactory compliance.—This item will be satisfied when—

a. The floors of all rooms in which shellfish are shucked or packed, or in which utensils are washed, are constructed of concrete of good quality, or of equally impervious tile laid closely with impervious joint material, or of metal surfacing with impervious joints, or of any other material which is equivalent to good quality concrete; and when the floors are maintained in good repair.

b. The floor surface is smooth, and graded to drain, and the junctions between floors and walls are impervious to water.

5. Walls and Ceilings.—The interior surfaces of rooms in which shellfish are shucked or packed, or in which utensils are washed, shall be smooth, washable, light-colored, and kept in good repair.

Public-health explanation.—Smooth, washable walls and ceilings are more easily kept clean and are, therefore, more likely to be kept clean. A light-colored paint or finish aids in the distribution of light and in the detection of unclean surfaces. Clean walls and ceilings are conducive to clean shellfish handling.

Satisfactory compliance.—This item will be satisfied when interior surfaces are of tile, concrete, cement plaster, concrete blocks, painted wood, or equivalent material, having a smooth, washable, light-colored surface. (Structural

members may be exposed, provided that they do not interfere with cleaning.)

6. Fly-Control Measures.—All outer openings to toilet and wash rooms, shucking and packing rooms, utensil cleaning and storage rooms, and locker rooms shall be effectively screened during the seasons when flies are present, unless other effective means are provided for preventing the entrance of flies. Effective in-plant fly-control measures shall be used to kill or capture flies which may enter the plant despite the screening. Shell-stock storage rooms shall be screened as necessary, to prevent the entrance of flies into the other portions of the plant. All interior doors or other openings into the packing room should be screened whenever necessary to keep the packing room free of flies.

Public-health explanation.—Flies may contaminate the shellfish with disease organisms, thus nullifying the effectiveness of all other public-health safeguards.

Satisfactory compliance.—This item will be satisfied when—

a. All outer openings are effectively screened whenever flies are present; or other effective devices are provided to prevent the entrance of flies.

b. Screen doors open outward and are self-closing.

c. Flies are not present.

d. Necessary internal fly-control measures are used, and such measures are approved by the State regulatory authority.

7. Lighting.—Ample natural and/or artificial light shall be provided in all working and storage rooms.

Public-health explanation.—Adequate lighting encourages cleanliness of rooms, equipment, and product, and helps to prevent eyestrain.

Satisfactory compliance.—This item will be satisfied when work and storage rooms are lighted to at least the intensity indicated below:

Type of area	*Foot-candles of illumination* [1]
Working surfaces in packing rooms	[2] 25
Shucking benches and utensil-washing areas	[2] 15
Storage rooms, including cold-storage rooms	[3] 5

[1] Approximate. Measure as incident light.
[2] Overall illumination level in area should be at least 10 ft.-c.
[3] Measured 30 inches above the floor.

8. Heating and Ventilation.—Working rooms shall be ventilated, and shall be heated when necessary.

Public-health explanation.—Uncomfortable working conditions impair the efficiency of the workers, and may result in insanitary practices.

Proper ventilation reduces condensation, and aids in retarding the growth of mold.

Satisfactory compliance.—This item will be satisfied when—

a. A comfortable working temperature is maintained.

b. Sufficient ventilation is provided to eliminate odors, discomfort, and excessive condensation.

9. Water Supply.—The water supply shall be easily accessible, adequate, and of a safe and sanitary quality.

Public-health explanation.—The water supply should be accessible in order to encourage its use in cleaning operations; it should be adequate to insure proper washing, rinsing, and bactericidal treatment of the equipment; and it should be of a safe and sanitary quality, to avoid contamination of the equipment and product.

Satisfactory compliance.—This item will be satisfied when—

a. The water supply is approved as safe by the responsible State authority, or complies with the Public Health Service *Drinking Water Standards.* (Private water systems are so constructed and operated as to be at least equal to the recommendations contained in Public Health Service Publication No. 24, "Manual of Individual Water Supply Systems.")[2] [3]

b. All shell-stock storage rooms, shucking and packing rooms, and utensil washrooms are provided with water outlets.

c. An automatically regulated hot-water system is provided which has sufficient capacity to furnish water with a temperature of at least 130° F. during all hours of plant operation.

[2] This publication is obtainable from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C., 20402; price 40 cents.

[3] The regulatory agency should collect water samples for bacteriological examination at not less than semiannual intervals if the supply should be from a private source. In addition, samples for bacteriological examination should be collected from all new private sources of supply before they are used, and from repaired supply facilities after they have been disinfected. Bacteriological examination shall be made in conformity with the standard methods recommended by the American Public Health Association.

d. Sufficient water is available for all plant needs. (Nonpressure supplies will not constitute compliance.)

e. Hot and cold water outlets are provided at each sink compartment, except that warm water only may be acceptable at handwashing sinks, as provided by Section B, Item 10e.

10. Plumbing and Related Facilities.—Plumbing shall be installed in compliance with State and local plumbing ordinances, or, in the absence of such ordinances, shall be substantially equivalent to the recommendations contained in the *American Standard National Plumbing Code ASA A40.8–1955.*[4] Lavatories with running hot and cold (or warm) water shall be so located that their use by plant personnel can be readily observed. Signs shall be posted in toilet rooms and near lavatories, directing employees to wash their hands before starting work and after each interruption. Conveniently located, separate toilets shall be provided for each sex; however, separate toilet facilities for each sex shall not be required when family shucking is carried on and satisfactory toilet facilities are located nearby, or when the plant has fewer than 10 employees.

Public-health explanation.—The organisms causing typhoid fever, paratyphoid fever, dysentery, and other gastrointestinal diseases may be present in the body discharges of cases or carriers, and may thus be present in the drainpipes in the plants. Correctly installed plumbing protects the water supplies from back siphonage through improperly installed fixtures or equipment. A safe water supply in a plant contributes to product purity and to the safety of the workers.

Handwashing facilities, including running water, soap, and sanitary drying facilities, are essential to the personal cleanliness of food-service workers. The posting of a handwashing sign is necessary to remind plant employees of this important public-health practice.

Satisfactory compliance.—This item will be satisfied when—

a. Plumbing is installed in compliance with State and local plumbing ordinances, or is substantially equivalent to the recommendations contained in the *American Standard National Plumbing Code ASA A40.8–1955.*

[4] This publication is obtainable from the American Society of Mechanical Engineers, 29 West 39th St., New York, N.Y.

b. There are no cross-connections between the approved pressure water supply and water from a nonapproved source, and there are no fixtures or connections through which the approved pressure supply might be contaminated by back siphonage.

c. There is at least 1 lavatory for every 20 employees among the first 100 employees, and at least 1 lavatory for each 25 employees in excess of the first 100. (Twenty-four lineal inches of wash sink or 18 inches of a circular basin, when provided with water outlets for such space, will be considered equivalent to 1 lavatory.)

d. Handwashing facilities are convenient to the work areas, and are so located that the person responsible for supervision can readily observe that employees wash their hand before beginning work and after each interruption. (Ordinarily, there should be at least one lavatory in the packing room for use by packing-room workers.)

e. The lavatories are provided with hot water (at least 100° F.), either from a controlled-temperature source with a maximum temperature of 115° F., or from a hot-and-cold mixing or combination valve. (Steam-water mixing or steam-water combination valves are not acceptable.)

f. Supplies of soap and single-service hand towels are available near the lavatory. (Other sanitary drying devices, if approved by the State regulatory agency, are also acceptable.)

g. Handwashing signs are posted in toilet rooms and near lavatories.

h. The toilet-room doors are tight-fitting and self-closing.

i. The toilet rooms are kept clean and in good repair.

j. A supply of toilet paper is available in the toilet rooms.

k. At least 5-foot-candle illumination (natural or artificial) is provided in toilet rooms; and toilet rooms are ventilated by a direct opening to the outer air, or by a mechanical ventilating system. (Exhaust fans, if used, should have a minimum capacity of 2 cubic feet a minute per square foot of floor area.) Air vents should be screened or have self-closing louvers.

l. Conveniently located, separate toilets are provided for each sex, excepting that separate

facilities need not be required when family shucking is carried on and satisfactory toilets are located nearby, or when the plant has fewer than 10 employees. The number of water closets provided complies with applicable State laws. In the absence of such laws, the following number of water closets should be provided:

Number of employees	Number of water closets [1]	
	Male	Female
1 to 9	1	1
10 to 24	2	2
25 to 49	3	3
50 to 74	4	4
75 to 100	[2] 5	[2] 5

[1] Wherever urinals are provided, one water closet less than the number specified may be provided for each urinal installed, except that the number of water closets in such cases should not be reduced to less than two-thirds of the minimum specified. A 24-inch trough will be considered equivalent to 1 urinal.

[2] One additional fixture for every 30 employees over the first 100.

m. No drainpipes or wastepipes are located over food processing or storage areas, or over areas in which containers or utensils are stored or washed.

11. Sewage Disposal.—Sewage shall be discharged into public sewers wherever possible. Where private sewage-disposal systems must be utilized, they shall be constructed according to State and local requirements; provided, that privies shall be acceptable only where water-carriage systems are not feasible. All newly constructed individual water-carriage systems shall be at least equal to the recommendations contained in the "Manual of Septic Tank Practice," Public Health Service Publication No. 526.[5] All sewage-disposal facilities shall be so constructed and maintained that waste will be inaccessible to flies and rodents.

Public-health explanation.—The organisms causing typhoid fever, paratyphoid fever, and dysentery may be present in the body discharges of cases or carriers. When sewage-disposal facilities are of a satisfactory type, there is less possibility that the shellfish being processed may become contaminated with fecal material carried by flies or rodents.

[5] This publication is obtainable from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C., 20402; price 40 cents.

Non-water-carriage sewage-disposal systems should be of a sanitary type, so that excreta are not accessible to flies or rodents.

Satisfactory compliance.—This item will be satisfied when—

a. Sewage is discharged into public sewers wherever possible.

b. Any private sewage-disposal facilities utilized are constructed and operated so as to comply with State and local requirements and privies are accepted only where water-carriage systems are infeasible. Any newly constructed individual water-carriage systems are at least equal to the recommendations contained in the "Manual of Septic Tank Practice," Public Health Service Publication No. 526.

c. No human excreta are accessible to flies or rodents.

12. Rodent Control. — Shellfish-processing plants shall be free from rodents.

Public-health explanation.—Rodents may contaminate the shellfish, utensils, or containers.

Satisfactory compliance.—This item will be satisfied when—

a. The plant is so constructed as to prevent ready entrance of rodents, and there is no evidence of rodents in any part of the plant.

b. Rodenticides which are highly toxic to humans are not stored in shellfish-processing plants, and are not used except under the supervision of a licensed pest-control operator or other qualified specialist. (Rodenticides which have a low toxicity for humans should be identified, stored, and used in such a manner as to prevent contamination of the product or ingredients, and to cause no health hazards to employees.)

13. Construction of Shucking Benches and Tables.—The tops of shucking benches and tables, and contiguous walls to a height of at least 2 feet above the bench top, shall be of smooth concrete, corrosion-resistant metal, or other durable, nonabsorbent material, free from cracks, and so constructed that drainage is complete and rapid and is directed away from the stored shellfish. Shucking blocks shall be easily cleanable. Wooden shucking blocks, if used, shall be of solid, one-piece construction, and shall be easily removable. Shucking blocks of lead or other toxic materials are prohibited. Stands or stalls, if any, shall be of painted, finished material.

Public-health explanation.—Unless shucking benches, stands, blocks, and stalls are made of smooth material and are easily cleaned, they will become very dirty and may contaminate the shellfish.

Satisfactory compliance.—This item will be satisfied when—

a. Shucking benches and contiguous walls to a height of at least 2 feet above the bench tops are of smooth concrete, corrosion-resistant metal, or other durable, nonabsorbent material, free from cracks.

b. Benches drain completely and rapidly, and drainage is directed away from any shellfish on the benches.

c. Shucking blocks are easily cleanable; of nontoxic material; of solid, one-piece construction; and, unless an integral part of the bench, are easily removed from the shucking bench. (Lead is acceptable for weighting breaking blocks only where the shellfish or knife will not come into frequent contact with the metal.)

d. Stands (or stalls) and stools are of painted, finished material.

e. Shuckers' stools have no attached padding, and are so constructed as to be easily cleaned.

14. Construction of Utensils and Equipment.—The food-product zone of utensils and equipment, including that used for ice-handling, shall be made of smooth, corrosion-resistant, impervious, nontoxic material which will not readily disintegrate or crack; and the utensils and equipment shall be so constructed as to be easily cleaned, and shall be kept in good repair.

Public-health explanation.—Colanders, schucking pails, skimmers, blowers, and other equipment or utensils which come into contact with the shucked shellfish and which have cracked, rough, or inaccessible surfaces, or which are made of improper material, are apt to harbor accumulations of organic material in which bacteria or other microorganisms may grow. These microorganisms may later cause illness among those who eat the shellfish, or spoilage in the shucked shellfish.

The slime and foreign material which accumulate in blower airpipes below the liquid level afford an excellent breeding place for bacteria. This material may be dislodged and forced into the batch of shucked shellfish then in the blower, thus increasing the bacterial content of the shellfish.

Satisfactory compliance.—This item will be satisfied when—

a. All pails, colanders, skimmers, paddles, tables, storage containers, returnable containers, blowers, and other equipment which come into contact with shucked shellfish, or with ice used for direct cooling of shellfish, are constructed of corrosion-resistant, nonabsorbent, nontoxic, smooth material which will not readily crack or disintegrate. (The use of enameled, tinned, or galvanized material in the food-product zone of equipment other than single-service shipping containers is not acceptable.)

b. There are no exposed screw, bolt, or rivet heads in the food-product zones, and all joints in the food-product zone are welded or soldered flush and have a smooth surface. (The use of welded joints which have been ground smooth is recommended, because soldered joints have been proven to be generally unsatisfactory for equipment used in the shellfish industry.)

c. Tanks, tubs, and shucked-stock storage containers are so located that their top rim is at least 2 feet above the floor.

d. All utensils and equipment are in good repair.

e. All equipment, including external and internal blower airlines and/or hoses below a point 2 inches above the overflow level of the tank, and blower drain valves, is so constructed as to be easily cleanable; when perforations in skimmers and colanders are smooth, to facilitate cleaning; when all internal angles in the food-product zone are filleted or otherwise fabricated to have an internal radius of at least ¼ inch; and when there are no V-type threads in the food-product zone of the blower. (The use of wire mesh in the food-product zone of equipment is not acceptable).[7] Non-food-product zones of equipment should be so constructed that they can be kept in a clean, sanitary condition; seams and joints should be welded, whenever possible; outside seams should be welded or filled with solder; and there should be no inaccessible spaces in which dirt or organic material might accumulate.

[7] Sanitary Standards describing the construction of valves, fittings, and pumps may be obtained from International Association of Milk and Food Sanitarians, Inc., Box 347, Shelbyville, Ind. Public Health Service Publication No. 943, *Shellfish Industry Equipment Construction Guides*, obtainable from PHS regional offices, contains guides for sanitary construction of shellfish blower tanks, skimmers, returnable shipping containers, and shucking buckets and pans.

f. The blower drain is not directly connected with a sewer.

g. A stand or shelf constructed of corrosion-resistant material, located so that the rim of the receiving container will be at least 2 feet above the floor, is provided under all chutes from skimmers and blowers, unless blowers discharge directly to a skimmer.

h. Air-pump intakes are located in a protected place.

i. Containers are clean; are fabricated of nontoxic metal, waxed paper, glass, or other impervious material; are so designed and fabricated that the contents will be protected from contamination during shipping and storage; covers of returnable containers are so designed as to protect the pouring lip of the container; and returnable containers are sealed so that tampering can be detected.

j. All blower tanks, skimmers, returnable shipping containers, shucking buckets and pans purchased and/or installed after September 30, 1965, shall comply with the sanitation requirements contained in the *Shellfish Industry Equipment Construction Guides* published by the Public Health Service. (Copies are available from State shellfish sanitation agencies or PHS regional offices.)

15. General Cleanliness.—Premises shall be kept clean and free of litter and rubbish. Miscellaneous and unused equipment and articles which are not necessary to plant operations shall not be stored in rooms used for shell-stock storage, shucking, packing, or repacking. No domestic animal or fowl shall be permitted to be in a shellfish-processing plant. The shell-stock storage, shucking, and packing portions of the plant, when in operation, shall be restricted to the handling of shellfish. Unauthorized persons shall be excluded from the plant.

Public-health explanation.—The presence of unused equipment and material interferes with the proper cleaning of the plant and equipment, and may, therefore, contribute indirectly to contamination of the food product. Shell or shucked stock may be contaminated by domestic animals, fowls, or rodents.

Satisfactory compliance.—This item will be satisfied when—

a. Material and equipment not in routine use are not stored in rooms used for shell-stock storage, shucking, packing, repacking, or container storage.

b. The shell-stock storage, shucking, and packing portions of the plant are not used for other operations while shellfish are being processed.

c. No domestic animals, rodents, or fowl are permitted in shellfish-processing plants.

d. Only personnel engaged in packing operations, supervisory personnel, authorized inspectors, or other persons specifically authorized by the plant manager, are allowed in the shell-stock storage, shucking, or packing rooms during periods of operation.

e. Premises are clean and free of litter and rubbish.

f. Shuckers do not go into or through the packing room for any purpose. (An exception may be made in small operations, where an employee may work in both the packing room and the shucking room. In such cases, the employee should be required to change aprons and wash his hands thoroughly before entering the packing room.)

16. Cleaning of Buildings and Equipment.—Shucking benches, shucking stools, floors, and, if necessary, walls of the shell-stock storage rooms and packing and shucking rooms shall be cleaned within 2 hours after the day's operations have ceased. Windows and skylights shall be kept clean. Refrigerators shall be kept clean. All equipment, utensils, and work surfaces, including the external and internal blower airlines and blower drain valves, shall be cleaned by scrubbing with water and detergent and rinsing with potable water within 2 hours after the day's operations have ceased.

Public-health explanation.—Clean workrooms and refrigerators reduce the chance of contaminating shellfish during shucking and processing. Shucked shellfish cannot be kept clean and safe if permitted to come into contact with equipment which has not been sanitized. Bactericidal treatment is not effective unless the equipment is first thoroughly cleaned.

The determination of adequate cleanup facilities will depend upon the method of bactericidal treatment selected (see Item 17) and plant-by-plant determination of what equipment and utensils may best be washed in a sink and what equipment may best be washed "in place." Detergents and brushes, including

special brushes that may be needed for cleaning equipment such as blower lines, should be available.

SINK WASHING

Wash sinks should be made of impervious, nontoxic material. Sink compartments should be large enough to permit the complete immersion of the largest utensil to be sink-washed. A second compartment should be provided in the sink for clean-water rinsing between washing and bactericidal treatment, unless some other acceptable method, such as a spray rinse, is provided. In the case of bactericidal treatment by immersion in hot water (Item 17a(2)), both the bactericidal treatment and rinse may be accomplished simultaneously in the second compartment. If bactericidal treatment by means of immersion in chemical solutions (Item 17a (3)), is selected, a separate compartment should be provided for this operation.

Number of Compartments Required in Sink

Method of bactericidal treatment	Method of rinse	
	Immersion	Spray
Steam cabinet	2	1
Hot water (170° F.)	2	[1]
Bactericidal solution	3	2

[1] Not applicable.

IN-PLACE WASHING

Utensils and equipment which have to be washed "in place" will require the same three steps of wash, rinse, and bactericidal treatment. A watertight container, such as a blower tank, is best washed by preparing a solution of the detergent in the container itself and using this to scrub all parts of the unit. Rinsing, preferably, should be accomplished either by complete filling or by thorough spray rinse. The bactericidal treatment methods are described in item 17.

Satisfactory compliance.—This item will be satisfied when—

a. Shell-stock storage, shucking, and packing rooms are cleaned within 2 hours after the day's operations have ceased.

b. All utensils, equipment, and work surfaces, including the external and internal blower airlines below the tank's liquid level, are cleaned by scrubbing with water and detergent and rinsing with potable water within 2 hours after the day's operations have ceased.

c. Cleaned benches, blocks, and stalls are flushed or sprayed as often as necessary, and at least once each week, with a solution containing not less than 100 parts per million of available chlorine, or other disinfecting agents in effective concentrations as approved by the State regulatory authority.

d. Refrigerators are clean.

e. Adequate cleanup facilities, including sinks, bactericides, detergents, and brushes, are available within the plant. Where chemical bactericides are used, a third compartment or spray rinse must be installed to permit a clean-water rinse between washing and bactericidal treatment. (Sink compartments should be large enough to permit complete immersion of the largest utensil to be washed.)

f. All shelves, tables, and other equipment in the shucking and packing rooms are clean.

g. Wash tanks, blowers, and containers for shucked-stock holding are flushed or spray-rinsed with tapwater after each emptying. (Dismantling is not necessary.) Periodic clean-water flushing of shucking benches, utensils, table surfaces, and other equipment during working periods is recommended.

17. Bactericidal Treatment of Utensils and Equipment.—All utensils and equipment in the shucking and packing rooms which come into contact with shucked shellfish shall be subjected to an effective bactericidal process at the end of each day's operation.[8]

Large equipment which might be recontaminated before use shall be cleaned at the end of each day's operation, and shall be subjected to effective bactericidal treatment immediately before use.

Returnable shipping containers, if used, are subjected to an effective bactericidal treatment process on the day they are to be used, and are protected against contamination until filled.

[8] Containers which have been subjected to bactericidal treatment should have a residual bacterial plate count of not more than 1 per milliliter of capacity, and equipment not over 50 colonies per 8 square inches (i.e., 1 per square cm.) of food-contact surface, in 3 out of 4 samples. (See *Standard Methods for the Examination of Dairy Products* for information on apparatus and procedure for making rinse and swab counts.)

Amounts of Chlorine Compounds Required To Give Approximately 100 p.p.m. of Chlorine by Readily Available Measuring Devices

Volume of water (gallons)	Dry chlorine compounds—available chlorine			Liquid hypochlorite solutions—available chlorine	
	15 percent	*25 percent*	*70 percent*	*1 percent*	*5 percent*
20	5½ tbs	3½ tbs	1½ tbs	3 cups	10 tbs.
40	11 tbs	6½ tbs	2½ tbs	3 pts	1¼ cups.
60	1 cup	10 tbs	3½ tbs	4¾ pts	2 cups.
80	1⅓ cups	13½ tbs	4½ tbs	6½ pts	2½ cups.
100	1⅔ cups	1 cup	6 tbs	4 qts	3 cups.
150	2¾ cups	1½ cups	9 tbs	6 qts	4¾ cups.
200	3⅓ cups	2 cups	12 tbs	2 gals	3 pts.

NOTE

Dry measure

1 tablespoon (tbs.)—approximately 0.3 ounce.
1 cup or ½-pint—approximately 5 ounces.

Liquid measure

1 tablespoon or 3 teaspoons—approximately 15 milliliters.
1 cup or ½-pint—approximately 16 tablespoons.

Public-health explanation.—Shellfish furnish an excellent growth medium for bacteria or other microorganisms. Small numbers of bacteria which might remain on improperly sanitized equipment may multiply to tremendous numbers in the finished pack.

Satisfactory compliance.—This item will be satisfied when—

a. All utensils and other equipment have been treated by one or more of the following methods:[9]

(1) Exposure for at least 15 minutes at a temperature of at least 170° F., or for at least 5 minutes at a temperature of at least 200° F., in a steam cabinet equipped with an indicating thermometer[10] located in the coldest zone. (Absence of a thermometer violates this item.)

If steam is used in the bactericidal treatment of blowers, a suitable cover and indicating thermometer are provided. A vent or valve should be installed at the bottom of large steam cabinets, to permit the discharge of cold air when steam is admitted.[11]

(2) Immersion in hot water of at least 170° F., for at least ½ minute. (An accurate indicating thermometer is provided and used.[10] [11] Ordinarily, a booster heater is necessary for water to be maintained at 170° F.

In the bactericidal treatment of blowers by this method, the blower may first be filled with water and then brought up to 170° F. by the addition of steam. This temperature should be checked by the indicating thermometer, and the ½-minute contact period measured after reaching this value. In practice, it has been found desirable to provide a connection to, or a removable section in, the blower line above the liquid level of the tank, where steam or hot water can be introduced.

(3) Immersion for at least 1 minute in, or exposure for at least 1 minute to, a flow of a solution containing not less than 50 parts per million of free chlorine. All product-contact surfaces must be wetted by the bactericidal solution, and piping so treated must be

[9] In medium and large shucking plants, a steam cabinet with auxiliary steam boiler is a most satisfactory type of equipment for bactericidal treatment of utensils and equipment.

[10] Thermometers should be accurate to within 2° F., should have scale divisions not greater than 2° F., and should be so installed as to be easily read. Accuracy of thermometer should be checked at least once each year by the State regulatory agency.

[11] Steam or hot-water treatment shall not be accepted as satisfactory compliance unless the equipment or containers are completely immersed or completely exposed for the required time or longer, at the required temperature or higher, throughout the period of exposure.

filled. Bactericidal sprays containing not less than 100 parts per million of free chlorine may be used for large equipment. Bactericidal treatment with chemicals is not effective unless the surface has been thoroughly cleaned.

Bactericides other than chlorine should not be accepted by the inspector until official tests by the proper regulatory authority have demonstrated that the bactericide in question is satisfactory for use in connection with shellfish sanitation. The local inspector should consult his State health organization regarding other bactericides in use in his area, so that he may be certain he is using the proper tests for effectiveness and concentration.

b. Large items which cannot be stored in a protected place are given effective bactericidal treatment immediately before starting each day's operation.

18. Storage of Equipment.—Equipment and utensils which have been cleaned and given bactericidal treatment shall be stored so as to be protected against contamination.

Public-health explanation.—The results of cleaning and bactericidal treatment may be negated by improper storage of the treated equipment.

Satisfactory compliance.—This item will be satisfied when the treated equipment is stored where it will be protected from contamination or unauthorized handling. (The utensils may be stored in the steam chest, in a special cabinet, or in the packing room on clean shelves, stands, tables, or racks. Storage racks should be at least 2 feet above the floor.)

19. Source of Shellfish.—All shellfish shall be obtained from a source approved by an official regulatory agency.

Public-health explanation.—The positive relationship between sewage-polluted shellfish and enteric disease has been demonstrated many times. The bacterial content of shellfish will, in general, mirror the bacterial quality of the water in which they have grown. Because shellfish pump and filter a large quantity of water, the bacteria count of the shellfish will normally exceed the bacteria count of the water in which they grow. The shellfish-water bacteria ratio depends upon the shellfish species, water temperature, presence of certain chemicals, and varying capabilities of the individual animals. If the water in which the shellfish are grown contains sewage, it may be assumed that the shellfish will also contain sewage bacteria or viruses, some of which may be capable of causing disease in man.

Furthermore, there is evidence that organisms of the Salmonella group, at least, will survive in shellfish for a considerable length of time after harvesting. Kelly and Arcisz ("Survival of Enteric Organisms in Shellfish," Reprint No. 3249, vol. 69, no. 12, Dec. 1954, pp. 1205–1210, *Public Health Reports*) have shown that viable *S. schottmuelleri* will persist for at least 49 days in shell oysters, *Crassostrea virginica*, stored at a temperature of 40° F. However, there was little evidence of multiplication of the bacteria in the shellfish during the storage period. In the same study, it was reported that *S. schottmuelleri* persisted in soft clams, *Mya arenaria*, stored at a temperature of 40° F., throughout a normal storage period.

Other public-health hazards may result from the presence of a naturally occurring paralytic shellfish poison in certain species of shellfish. The occurrence of this poison is apparently related to the concentration of a dinoflagellate, *Gonyaulax*, in the water of the growing area. Species of shellfish which may accumulate this poison under appropriate conditions include *Mytilus californianus*, *Mytilus edulis*, *Mya arenaria*, *Saxidomus gigantius*, *Donax serra*, and *Modiola modiolus*. The poison occurs only in well-defined areas and, in some instances, only during certain seasons. It is not widespread over all shellfish-producing areas.

Cooking does not insure safety of shellfish since, in ordinary cooking processes, shellfish may not be sufficiently heated to insure a kill of pathogenic organisms, although a considerable reduction will take place. One investigator has found that oysters must be held in a water bath at 138°–142° F. for 1 hour before the coliform count is reduced to zero. (See Salafranca, E. S., "The Effect of Salt, Vinegar, and Heat on the Coliforms in Oysters," *The Philippine Journal of Fisheries*, vol. 2, no. 1, 1953.) Also, normal cooking processes cannot be relied upon to destroy paralytic shellfish poison if it should be present.

The primary safeguard in the entire shellfish sanitation program is, therefore, that of

obtaining shellfish which are free of disease-causing organisms, and which contain, at most, only relatively small quantities of poison. If shell-stock from sewage-polluted or highly toxic areas are shucked, then almost all of the other sanitary safeguards of the cooperative certification program will have been circumvented.

Satisfactory compliance.—This item will be satisfied when all shellfish are obtained from one or more of the following sources: (a) An approved growing area; (b) a State-certified shellfish shipper; or (c) a State-approved shellfish-treatment plant.

20. Refrigeration of Shell-Stock.—Shell-stock of shellfish species which have poor keeping qualities (such as the soft-shell clam, *Mya arenaria*, and the mussels, *Mytilus edulis* and *Mytilus californianus*) shall be refrigerated during shipment and holding.

Public-health explanation.—If shell-stock of shellfish species which have poor keeping qualities are not refrigerated during prolonged storage, the quality of the product will be impaired and the bacteria counts will be increased.

Significant increases in coliform counts in shell oysters stored overnight may also occur under some conditions.

Satisfactory compliance.—This item will be satisfied when—

a. Shell-stock of shellfish species with poor keeping qualities are stored at a temperature of 50° F. or less, but are not frozen, and when, at points of transfer, such as loading docks, shell-stock are not permitted to remain unrefrigerated for prolonged periods.

b. Shell-stock are protected from the sun during warm weather to the extent necessary to prevent spoilage.

21. Shucking of Shellfish.—Shellfish shall be shucked in such a manner that they are not subjected to contamination. Shell-stock shall be reasonably free of mud when shucked.[12] Only live shellfish shall be shucked.

Water used in fluming or washing shell-stock shall be from a source approved by the State regulatory agency. Use of overboard water must be specifically approved by the State agency, and its use limited to shell-stock washing.

Public-health explanation.—If shellfish are not reasonably clean at the time of shucking, a considerable quantity of the adhering material will be mixed into the shucked shellfish during the shucking process, thus contributing to high bacteria counts in the final product. (See Public-health explanation, Section A, Item 2, Washing of Shell-Stock.)

The bacteria count of the final pack is related to the time intervening between shucking and attainment of a temperature of approximately 45° F., i.e., the length of time the shellfish are at a temperature favorable to the rapid growth of bacteria. Factors in the shucking-room procedure which influence the length of time shucked shellfish are above 45° F. include the quality and species of the shellfish being shucked, the speed of the individual shucker, the practice of returning "overage" or "bluff" to the shuckers, the frequency with which the shucking containers are delivered to the packing room, the air temperature, and the temperature of the shell-stock being shucked.

The total elapsed time which shellfish may be held on the shucking bench without causing high bacteria counts is closely related to the packing-room procedures, the size of containers into which the shucked shellfish are being packed, the temperature of blower water, the temperature of the oysters, and the method of cooling.

From the standpoint of bacteriological quality, it is preferable that the elapsed time between shucking and the attainment of a temperature of 45° F. not exceed 4 hours. More rapid cooling is very desirable.

The return of overage (bluff) from the packing room to the shucker would ordinarily result in at least a portion of the shellfish being held on the shucking bench for more than 2 hours and would permit an undesirable growth of bacteria. When bench grading of shellfish is practiced, it is especially important that all grades of shellfish be delivered to the packing room at least once every 2 hours when the temperature of the shellfish exceeds 45° F. To en-

[12] The primary responsibility for washing the shellfish free of mud is placed on the harvesters. However, this does not relieve the plant operator of responsibility for compliance with this item. (See Section A, Item 2.) Bacteria counts of mud from Tangier Sound averaged about six times higher than bacteria counts of oysters from the same growing area. See "Bacteriological Survey of an Oyster Bed in Tangier Sound, Maryland" by M. W. Vaughn and A. W. Jones. Chesapeake Science, Vol. 5, no. 4, Winter 1964.

courage frequent delivery of the shucked shellfish to the packing room, it is suggested that the shucking containers be limited to a size that an average shucker might reasonably be expected to shuck full in 1 hour.

Storage of shucked shellfish on the shucking benches for long periods of time increases the possibility of contamination of the shucked shellfish by splash or flies.

Bacteriological examination of the water in dip buckets has shown very high coliform counts. Since water from the dip bucket may be carried over into the shucked shellfish, there is a need for controlling the sanitary quality of the water.

Satisfactory compliance.—This item will be satisfied when—

a. Water used for fluming or washing shellstock is obtained from a source approved by the official State regulatory agency.

b. Shell-stock are reasonably free of mud when shucked.

c. Only live shellfish are shucked.

d. The use of "dip" buckets is prohibited. (Where conditions dictate the need for frequent rinsing of the shucker's hands and knife, it is recommended that water outlets be installed at the shucking bench convenient to each shucker, or that a flow-through type of dip bucket, in which the water is continually replaced by clean tapwater, be installed.)

e. Shucking containers are rinsed with running tapwater before each filling.[13]

f. The return of overage (bluff) from the packing room is not permitted.

22. Shell Disposal.—Shells from which meats have been removed shall be removed promptly from the shucking room.

Public-health explanation.—Shell accumulations in the shucking room make it difficult to keep the room clean, and the chances of contaminating the shucked product are increased.

Satisfactory compliance.—This item will be satisfied when shells are promptly removed from the shucking room to prevent interference with the sanitary operation of the plant. Any method of shell removal which results in the prompt removal of shell without contaminating the shucked product is acceptable. These methods include, but are not limited to, conveyors, baskets, barrels, wheelbarrows, or shell drop-holes. (It is recommended that unused portions of body meats, such as clam siphons, not be disposed of with shells. Fly-control measures may be necessary in the vicinity of shell piles.)

23. Handling of Single-Service Containers.—All single-service containers shall be stored and handled in a sanitary manner and, where necessary, shall be given bactericidal treatment immediately prior to filling.

Public-health explanation.—Single-service containers which have not been stored and handled in a sanitary manner may become contaminated and thus may contaminate the packaged shellfish.

Satisfactory compliance.—This item will be satisfied when—

a. Single-service containers and covers are kept in original cartons until used, and are kept clean and dry.

b. Containers which may have been contaminated during storage are cleaned and given bactericidal treatment immediately prior to filling, or are discarded.

c. Plant employees use every reasonable precaution to prevent the food-contact surfaces of containers from coming into contact with their person or clothing.

d. Container-storage rooms are kept clean and free of rodent or insect infestation; containers are so stored that the presence of rodents may be easily detected;[14] and container-storage rooms are not used as general storerooms for unused equipment and materials.

e. Single-service containers in the packing rooms are kept on stands or tables at least 2 feet above the floor, and are protected against contamination from splash.

24. Packing of Shucked Shellfish.—Shucked shellfish shall be packed without exposing them to contamination. Shucked shellfish shall be packed and shipped in clean, single-service containers made of impervious materials, or in clean, properly designed, returnable containers[15] so sealed that tampering can be detected. Each individual package of fresh

[13] Food and Drug Administration requirements limit the amount of water in the shucking containers to one-fourth of the capacity of the container.

[14] Containers should be stored on open racks or pallets at least 8 inches above the floor and 18 inches away from the walls.

[15] Returnable containers will be accepted only for interplant shipment of shucked shellfish.

or frozen shellfish shall have permanently recorded on the package or label, so as to be easily visible, the packer's, repacker's or distributor's name and address, and the packer's or repacker's certificate number preceded by the abbreviated name of the State. Containers holding 1 gallon or more shall have the identification on the container wall, unless the cover becomes an integral part of the container during the sealing process.

Each shucker packer and repacker shall legibly code-date each package of fresh and frozen shucked shellfish to indicate the date of packing or repacking. (A recommended code-dating system is included in Appendix B.)

Public-health explanation.—Unless shucked shellfish are packed in clean containers, all precautions taken to produce a clean and safe product may be negated.

The State permit number facilitates tracing the product to the plant in which it was actually prepared. The date or code on the product further assists the regulatory authority in tracing shellfish to their point of origin.

Satisfactory compliance.—This item will be satisfied when—

a. Skimmer tables are so located that they will not receive drainage from the delivery window.

b. Shuckers do not place shucking containers on skimmers.

c. Shellfish are not exposed to contamination during packaging.

d. Containers are closed as soon after filling as is feasible.

e. The name and address of the packer, repacker, or distributor, and the certificate number, preceded by the abbreviated name of the State, of the packer or repacker, are permanently recorded on the package so as to be easily visible. Wording, such as "Packed for" or "Distributed by," is used wherever necessary to clarify the name on the label. Containers holding 1 gallon or more have the identification on the side wall, rather than on the cover, unless the cover becomes an integral part of the container during the sealing process.[16] (The presence of containers or covers with a plant number other than that on the unexpired certificate for the plant will be considered a violation of this item. Packing into containers with other plant certification numbers is not permitted. Recording identification information on containers by use of a rubber stamp will not be acceptable for compliance with this item.) Returnable shipping containers may be identified with tags of at least 2⅝ x 5¼ inches in size and made of substantial water-proof stock.

f. Each container or package of fresh or frozen shucked shellfish of the shucker packer or repacker has legibly recorded on the label or package, code symbols giving the date of packing, or if repacked, the date of repacking: *Provided*, that this requirement shall not apply to returnable containers.[15] Such code dating of frozen shellfish need not be on the outer wrap. (The packaging code shall be made available at the request of the State shellfish-regulatory authority.)

25. Refrigeration of Shucked Shellfish.—Shucked shellfish shall be cooled to an internal temperature of 45° F. or less within 5 hours after shucking. Storage temperatures shall not exceed 45° F. Storage at 34°–40° F. is strongly recommended.

A temperature of 0° F. or less shall be maintained in the frozen-storage rooms.

Public-health explanation.—Shucked shellfish are an excellent medium for the growth of bacteria. Thus, it is very important that the packaged shellfish be cooled promptly, so that bacteria will not multiply. Also temperatures above 45° F. may accelerate physical deterioration and spoilage of shucked stock. Alternate freezing and thawing of shellfish may cause deterioration and spoilage.

Research by the Public Health Service with *Crassostrea virginica* and *Crassostrea gigas* stored in ice and at 37.5° F. sustained slight increases in coliform MPN's during the first 5 days of storage. After the storage period of 5 days, there was a continuous increase in MPN values until the 25th day, at which time the coliform MPN's exceeded the original values by at least 50 times. Oysters from the same lots stored at 50° F. sustained a continuous increase in coliform MPN's exceeding 1,000 times the original count within 5 days. In the same studies oysters stored in ice and at 37.5° F. sustained only slight increases in standard plate counts after being stored for 5 days. However,

[16] Additional information on product quality, quantity and identification may be required by Federal and/or State laws.

with a storage temperature of 50° F. the same oysters sustained plate count increases which exceeded 180 times their original count within 5 days.

The fecal coliform MPN's decreased slightly from their original MPN values during storage in ice, at 37.5° F. and at 50° F., with the exception that there was a frequent increase in fecal coliform MPN's at the 50° F. storage temperature. (See *Time and Temperature Effects on Stored Oysters*, by C. B. Kelly, Proceedings 1964 Shellfish Sanitation Workshop, available from Shellfish Sanitation Branch, Public Health Service, Department of Health, Education, and Welfare, Washington, D.C., 20201.) Appendix B contains charts, figures 1, 2, and 3, which present the above information in graphic form. Appendix B also contains in graphic form the length of time necessary to cool oysters in various size containers to 40° F. under dry refrigeration and in crushed ice.

Satisfactory compliance.—This item will be satisfied when—

a. Shucked shellfish are cooled to an internal temperature of 45° F. or less within 5 hours after shucking, and are stored and shipped under similar temperature conditions.

b. Packaged shellfish to be frozen are properly stacked to insure rapid freezing, and are frozen at an ambient air temperature of 0° F. or less, with packages frozen solid within 12 hours after the start of freezing; and frozen shellfish are handled in such a manner as to remain frozen solid, and are held at 0° F. or less.[17]

c. All containers holding shucked shellfish shall be kept covered while under refrigeration.

26. Ice.—Ice shall be obtained from a source specifically approved by the State regulatory agency, and shall be stored and handled in a clean manner.

Public-health explanation.—Ice may become contaminated during freezing or in subsequent storing and handling.

Shucked shellfish packed in non-hermetically sealed containers may also be contaminated by dirty ice. When containers of shellfish are stored in ice, a partial vacuum is formed within the container which may draw water from the melting ice into the container.

Satisfactory compliance.—This item will be satisfied when—

a. Ice is manufactured in an establishment or machine approved by the proper State regulatory authority.

b. Ice is stored and handled in such a manner that it will not be contaminated.

c. Ice, other than that manufactured in the shellfish-processing establishment, is washed before use.

27. Records.—Complete and accurate records shall be kept by every shellfish dealer.

Public-health explanation.—In case of an outbreak of disease attributable to shellfish, it is necessary that health departments be able to determine the source of contamination, and thereby to prevent any further outbreaks from this source. This can be done most effectively by following the course of a shipment, through all the various dealers who have handled it, back to the point of origin by means of records kept by the shellfish dealers.

Satisfactory compliance.—This item will be satisfied when each shucker-packer, repacker, shell-stock shipper, or reshipper establishes and maintains a ledger record or record system satisfactory to the State control agency indicating from whom shellfish were purchased or secured; the date purchased or secured; State designated areas from which the shellfish were harvested; and the names and addresses of persons to whom shellfish were sold. (An example ledger form is contained in App. B.)

28. Health of Personnel.—Any person known to be infected with any disease in a communicable form, or to be a carrier of any disease which can be transmitted through the handling of shellfish, or who has an infected wound or open lesion on any exposed portion of his body, shall be excluded from the shucking or packing plant. An owner or manager who has reason to suspect that any employee has contracted a communicable disease shall immediately notify the proper health officials. Pend-

[17] It is recommended that freezing and frozen-storage compartments be equipped with at least the following equipment: (1) Automatic temperature-regulating control; (2) an indicating thermometer, so installed as to indicate accurately the temperature within the storage compartment; and, (3) except for plate freezers, a recording thermometer installed on each freezing or storage compartment in such a manner as to record accurately the temperature within the compartment at all times. Recording-thermometer charts should be retained for at least 1 year.

ing appropriate action by the health officials, said employee shall be excluded from the plant.

Public-health explanation.—Persons who are infected with, or who are carriers of, organisms of typhoid fever, dysentery, septic sore throat, or certain other communicable diseases, might transmit such disease to others through shucked shellfish. A person with an infected wound or open lesion on the exposed portion of his body might transmit toxin-producing bacteria to the shucked shellfish, and thus cause food poisoning to consumers thereof.

Careful, daily observations of the health of employees, with proper inquiries when indicated, and exclusion of employees who are ill, will tend to prevent possible contamination of the shucked stock with pathogenic organisms.

Satisfactory compliance.—This item will be satisfied when—

a. Persons with infected wounds or open lesions on the exposed portion of their bodies, and those who are known to be carriers of, or infected with, typhoid fever, dysentery, or other communicable diseases likely to be transmitted by shucked shellfish, are excluded from the plant.

b. Daily observations of employees are made by the supervisor, with reasonable inquiries being made when signs of illness appear.

c. Upon an inquiry indicating the possibility of a communicable disease, the ill employee is excluded from the plant pending clearance by the health officials.

d. Employees having diarrhea or sore throat promptly report this to the manager.

29. Supervision.—The management shall designate a reliable individual to be accountable for compliance with the items of this manual having to do with plant and personnel cleanliness.

Public-health explanation.—Handwashing by food-service employees is a very important public-health measure. Unless someone is made specifically responsible for this practice, it is apt to be forgotten or overlooked. Similarly, one person must be responsible for plant clean-up. Clean floors, walls, and benches reduce the chance of contamination of the shellfish or utensils during shucking or packing operations. Periodic disinfection of the plant will reduce the possibility of contaminating the shellfish.

Satisfactory compliance.—This item will be satisfied when a reliable individual has been designated by the management to supervise the activities enumerated in Section B, Items 16, 28, and 30, and when there is evidence that he has been executing these duties. Designation of such an individual does not relieve management of responsibility for compliance with these items.

30. Cleanliness of Employees.—Employees shall wash their hands with soap and water before beginning work, and again after each interruption. (Supervision of handwashing is a specific responsibility of management, Section B, Item 29.)

When manual handling of shucked shellfish becomes necessary, sanitized rubber gloves shall be worn, or the hands shall be washed and disinfected immediately before such manual handling.

Finger cots, gloves, and/or shields, if worn by shuckers, shall be sanitized as often as necessary and at least twice daily. (Use of waterproof finger cots or shields is recommended as preferable to those made of an absorbent material.) Any person who handles shucked shellfish shall wear a clean apron or coat.

Employees shall not use tobacco in any form in the rooms in which shellfish are shucked or packed.

Public-health explanation.—The hands of all employees frequently come into contact with their clothes; hence, it is important that the clothes worn during the handling of shucked shellfish be clean. The nature of the work makes it necessary that protective outer garments be worn. Finger cots, gloves, and/or shields, unless sanitized periodically, will accumulate bacteria which will contaminate the shucked shellfish.

Disease or toxin-producing bacteria may be carried on the hands of shuckers and/or packers; hence, handwashing is very important.

Satisfactory compliance.—This item will be satisfied when—

a. Clean aprons or coats are worn by any persons handling shucked shellfish.

b. Aprons or coats not in use are stored in a room or locker provided for this purpose.

c. Finger cots, gloves, and/or shields, if worn by shuckers, are sanitized as often as necessary

and at least twice daily, and are properly stored until used. (See Section B, Item 18.)

d. Sanitized rubber gloves are worn during, or the hands are washed and disinfected *immediately* before, any manual handling of the shucked shellfish. (A bucket or pan of the bactericidal solution should be present in the packing room during periods of operation.)

e. There is no evidence of spitting, or of the use of any form of tobacco, by employees in rooms in which shellfish are shucked or packed.

f. Employees wash their hands with soap and water before beginning work and after each interruption, and utensil sinks are not used for handwashing.

Section C

PACKING AND SHIPPING SHELL-STOCK

A shell-stock shipper deals only in shellfish which are still in the shell; hence, his plant sanitation requirements are not as extensive as those of a shucker-packer or repacker. A shipper holding only a shell-stock certificate shall not shuck shellfish or repack shucked shellfish. Operators of "buy" boats and "buy" trucks shall be considered shell-stock shippers.

Shellfish in the possession of a shell-stock shipper shall be protected against contamination. The shell-stock shipper shall keep records of his purchases and sales, and shall tag shell-stock shipments so that they may be identified.

To effectuate the needed sanitary safeguards, the shell-stock shipper shall comply with items 1 and 2 below, and with the items of sections A and B indicated for each type of shell-stock operation in table II.

1. Washing of Shell-Stock.—Shell-stock shall be reasonably free of mud at the time of shipment.

Public-health explanation.—See Section A, Item 2, concerning reasons for washing shell-stock. If shellfish are washed in polluted water, the shellfish may be contaminated. Therefore, water used for shell-stock washing should be of approved sanitary quality. Preferably, shell-stock should be washed at the time of harvesting or as soon thereafter as is feasible.

Satisfactory compliance.—This item will be satisfied when—

a. Shell-stock are reasonably free of mud at the time of shipment. The qualifications applicable to washing of shell-stock under Section A, Item 2a, also apply to this item.

b. Water used for shell-stock washing is from a source approved by the official State regulatory authority.

2. Packing and Shipping of Shell-Stock.—Shell-stock shall be packed and shipped in clean containers, under conditions which will prevent contamination. When consigned in bulk, shell-stock shall be shipped in clean con-

TABLE II

Shell-stock operation type	Applicable item—sec. A		Applicable item—sec. B											
	1	3	1	3	9	10	11	12	15	19	20	25	27	28
Shore establishment † buys, stores, packs.	—	—	X	X	a	a, d, f, g, h, i, j, k, m*	X	X	a, c, d, e	X	X	X**	X	X
Harvests or Buy Boats, all operations on boat.	X	X	—	—	—	—	—	—	a, c, d	X	X	—	X	X
Buy Trucks, all operations on truck.	e, c, f	—	—	—	—	—	—	—	a, c, d	X	X	—	X	X

*= Item b also applies to pressure systems.
**= Applies if shucked shellfish are handled.
†= If shore establishment operates boats or trucks, requirements for Buy Boats and Buy Trucks are also applicable.
X = Required.
— = Not required.

veyances, under conditions which will prevent contamination.

Shell-stock in transit shall be identified by a tag or label fastened to each shipping container and bearing the number of the shipper, his name and address, the name and address of the consignee, and the kind and quantity of shell-stock in the container. The following classes of shell-stock shippers shall be exempt from this requirement: Harvesting Only; Buy Boats; and Buy Boats with Storage on the Boats.

Public-health explanation.—Shellfish must be protected during shipment to avoid contamination and spoilage. Shipments must be tagged, to make it possible for the control authorities to identify shipments of shellfish.

Satisfactory compliance.—This item will be satisfied when—

a. Shipping containers and vehicles are clean.

b. Tags at least 2⅝ by 5¼ inches in size, and made of substantial, waterproof stock, and carrying the name, address, and number of the dealer, the name and address of the consignee, and the kind and quantity of the shell-stock, are securely fastened to each individual container of shell-stock. (Bulk shipments, "e.g., unpackaged," of shell-stock to a certified shipper require only a single tag or bill of lading which gives the required information.)

Section D

REPACKING OF SHELLFISH

The packaging of shucked shellfish in plants other than those in which they were initially shucked exposes the shucked shellfish to additional handling and increases the possibility of contamination. Combining in one pack shucked shellfish from more than one dealer permits the possibility of contamination of the entire pack if shellfish from any one of the dealers should be contaminated. When repacking is practiced, tracing of shellfish to the source is difficult.

When repacking is practiced, it shall be done in accordance with the requirements of table III and the items which follow in this section.

1. Shucked Shellfish Intended for Repacking.—Shucked shellfish to be repacked shall be received at the repacking plant in approved shipping containers at a temperature of 45° F. or less. Frozen shellfish which have thawed shall not be repacked or repackaged.

Public-health explanation.—Shellfish which are not shipped in properly sealed, easily cleanable containers may become contaminated. Shellfish which have not been properly refrigerated may have excessively high bacteria counts.

If frozen shellfish are thawed during repacking, high bacteria counts in the final pack may result.

Satisfactory compliance.—This item will be satisfied when—

a. All shucked shellfish are received in properly designed [19] containers. (Returnable containers should be so sealed that any tampering will be evident.)

b. Shellfish are received at a temperature of 45° F. or less. Frozen shellfish which have thawed are not repacked or repackaged.

2. Refrigeration During Repacking.—The temperature of the shellfish shall not exceeed 45° F. during the repacking process. Frozen shellfish shall not be thawed during the repacking process.

Public-health explanation.—Bacteria multiply rapidly at high temperatures, but are unable to do so at low temperatures. Adequate cooling, therefore, helps to produce a low bacteria count in the final product.

TABLE III

Item number in Section B	Item	Applicable satisfactory-compliance items
2	Plant arrangement	a, d, and e.
4	Floors	all items.
5	Walls and ceilings	all items.
6	Fly-control measures	all items.
7	Lighting	all items.
8	Heating and ventilation.	b.
9	Water supply	all items.
10	Plumbing and related facilities.	all items.
11	Sewage disposal	all items.
12	Rodent control	all items.
14	Construction of utensils and equipment.	all items.
15	General cleanliness	all items.
16	Cleaning of buildings and equipment.	a, b, d, e, f, and g.
17	Bactericidal treatment of utensils and equipment.	all items.
18	Storage of equipment	all items.
19	Source of shellfish	all items.
23	Handling of single-service containers.	all items.
24	Packing of shucked shellfish.	c, d, e, f, and g.
26	Ice	all items.
27	Records	all items.
28	Health of personnel	all items.
29	Supervision	all items.
30	Cleanliness of employees.	a, b, d, e, and f.

[19] See Section B, Item 14.

Satisfactory compliance.—This item will be satisfied when—

a. The internal temperature of nonfrozen shellfish being repacked does not exceed 45° F. during the repacking process. (This may be accomplished by expeditious handling, by continuous refrigeration of the shellfish being repacked, or by the provision of a refrigerated room for the repacking operation.)

b. Frozen shellfish are not thawed during the repacking process.

3. Cleaning of Returnable Shipping Containers.—Returnable shipping containers shall be thoroughly cleaned as soon after emptying as is practicable.

Public-health explanation.—Containers are most easily cleaned before the organic material has had time to dry.

Satisfactory compliance.—This item will be satisfied when returnable shipping containers are thoroughly cleaned as soon after emptying as is practicable.

Section E

RESHIPPERS

Persons who reship shellfish from certified shell-stock shippers, shucker-packers, or repackers to other certified shippers or to final consumers should be licensed and certified as reshippers. Use of this shipper classification is left to the option of the State.

(A reshipper is not permitted to shuck shellfish, nor to repack shucked shellfish.) Requirements for a reshipper depend upon the type of product handled and the methods of operation. If shell-stock are handled, the applicable requirements outlined for a shell-stock dealer must be met (Sec. C).

If only shucked shellfish are handled, the required items are—

1. Section B, Item 19, "Source."
2. Section B, Item 25, "Refrigeration."
3. Section B, Item 27, "Records."

Appendix A

INSPECTION OF CERTIFIED SHELLFISH SHIPPERS

General: Section A–2 of Part I specifies that shellfish shippers certified by States under the Cooperative Program shall meet the construction requirements of Part II of this manual prior to certification, and shall maintain satisfactory sanitary conditions during periods of operation. Establishments not meeting these two requirements will not be eligible for inclusion on the Public Health Service list of State certified shellfish shippers.

Plants will be considered as meeting the basic sanitary standards of Part II of this manual when the two following conditions are met: (1) the same sanitation item is not violated repeatedly, and (2) a sanitation rating of at least 80 percent, as determined by a standarized inspection procedures, is achieved.

Sanitation rating of shucker-packer and repacker establishments should be determined by use of an inspection report equivalent to PHS–769, a copy of which is included as page 28 of this manual. The percentage values assigned to each item are shown on the sample inspection report. Percent values are not shown for items B–1, B–19, C–1, C–2, D–1, D–2, and D–3 since any violations of these items are applied against the tentative percentage rating for the plant. Percentage values for these items are given in table IV. Section C of the inspection report (PHS–769) should not be used unless the shucker-packer ships a portion of his product in the shell. Section D of the inspection report (PHS–769) should not be used unless the shucker-packer also repacks shellfish.

Sanitation ratings for shell-stock shippers should be determined by use of an inspection report equivalent to the "Shell-Stock Shipper Inspection Report," a copy of which is included as page 29 of this manual. The percentage values assigned to each item are shown on the sample inspection report.

Sanitation Rating for Shucker-Packers: In computing a sanitation rating for a shucker-packer the violations recorded under section B on the inspection report should be totaled using the indicated percentage values. This total, when subtracted from 100, will give a tentative percentage sanitation rating. If items B–1 or B–19 are violated an additional 25 percent or 50 percent should be subtracted from the tentative rating (see table IV). Similarly any violations recorded under sections C and D should should also be subtracted according to the table IV schedule.

TABLE IV

Percentage Values for Use in Establishing Sanitation Ratings of Shucker-Packers by Use of Standardized Inspection Report, PHS-769

Section	Item number	Item	Percent values
B	1	Wet Storage	25
	19	Source of Shellfish	25
C	1	Shell-Stock Washing	1
	2	Shell-Stock Shipping Container	2
D	1	Shellfish for Repacking	2
	2	Refrigeration	4
		Frozen Shellfish	1
	3	Returnable Containers, Cleaned	1

Sanitation Ratings for Repackers: The instructions for rating a shucker-packer should be followed in rating a repacker except that section B items not applicable to the operation of the repacker should be indicated on the inspection report and should be taken into consideration in computing the tentative sanitation rating according to the following formula:

$$\text{Tentative sanitation rating (percent)} = \frac{(\text{Percent compliance section B})\ (100)}{(\text{Percentage of section B applicable})}$$

Any violations noted for items B–1, B–19, C–1, C–2, D–1, D–2, or D–3 should be subtracted from the tentative rating according to the table IV schedule to obtain a final rating.

Sanitation Ratings for Shell-Stock Shippers: The required physical facilities and operating procedures for shell-stock shippers varies with the type of establishment. Therefore, all items on the inspection report will not apply to every shipper. (See section C, Part II, this manual.) In completing the inspection report those items which are not applicable to the particular shipper should be so indicated. These "not applicable" items should be taken into consideration in computing the sanitation rating for the shipper according to the following formula:

$$\text{Sanitation rating (percent)} = \frac{(\text{Percent compliance})\ (100)}{(\text{Percent applicable})}$$

PHS–769–1
Rev. 5–65

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE

Form Approved:
Budget Bureau No. 68–R633

SHUCKING-PACKING PLANT INSPECTION REPORT

PLANT NAME AND LOCATION

CERTIFICATE NO.

PRODUCT

NUMBER OF SHUCKERS

SECTION B (Shucking-Packing)

1. WET STORAGE:
- Protected; State approved — *

2. PLANT ARRANGEMENT:
- Not subject to flooding — 1.0
- Separate shucking and packing rooms — 1.0
- Proper delivery window — 0.5
- Adequate packing & clothing rooms — 1.0

3. DRY STORAGE OF SHELL STOCK:
- Floors, impervious, graded to drain — 2.0
- Walls, smooth, well-constructed — 0.5
- Conveyances easily-cleanable; clean — 0.5
- Not used as passageway — 0.5
- Floor drain protected against backflow — 0.5

4. FLOORS:
- Impervious; smooth; graded to drain — 1.0

5. WALLS AND CEILINGS:
- Smooth; washable; light-colored — 2.0

6. FLY CONTROL MEASURES:
- Adequate screens or fans; self-closing, outward-opening screen doors — 1.5
- Approved internal fly-control measures — 1.0
- Free from flies — 1.0

7. LIGHTING:
- Ample; properly distributed — 2.0

8. HEATING AND VENTILATION:
- Comfortable temperature; well ventilated — 0.5

9. WATER SUPPLY
- Safe; adequate quantity — 15.0
- Outlet in each room — 0.5
- Ample; regulated, hot water supply — 2.0
- Hot & cold water at each sink vat — 0.5

10. PLUMBING AND RELATED FACILITIES:
- Approved, no cross-connections — 6.0
- Adequate number and location of lavatories; hot and cold water; mixing valves; soap; single-service towels — 2.0
- Handwashing signs posted — 0.5
- Adequate number and location of toilets; clean; good repair; ventilated; lighted; supply of toilet tissue — 2.0
- Toilet room doors, self-closing, tight — 1.0
- No overhead drains — 0.5

11. SEWAGE DISPOSAL: Satisfactory — 1.0

12. RODENT CONTROL:
- Rodent free; proper construction — 1.5
- Safe use and storage of rodenticides — 1.0

13. CONSTRUCTION OF BENCHES:
- Smooth; impervious; self-draining — 2.0
- Blocks easily cleanable; non-toxic — 0.5
- Stalls & stools cleanable; painted — 0.5
- No attached padding on stools — 0.5

14. EQUIPMENT CONSTRUCTION:
- Material; smooth surfaces & joints; good repair; easily cleanable; equipment installed complies sub-item j — 2.5
- Container rims 2' above floor — 0.5
- Blower not connected directly to sewer — 0.5
- Blower air intake protected — 0.5

15. GENERAL CLEANLINESS:
- No miscellaneous equipment or material — 1.0
- Plant used only for shellfish — 0.5
- No animals, fowl, unauthorized persons — 1.0
- Premises clean; no rubbish — 0.5
- Shuckers do not go into packing room — 0.5

16. CLEANING:
- Building & equipment cleaned within 2 hrs. — 2.0
- Benches and blocks disinfected weekly — 0.5
- Sinks, bactericides, detergents, and brushes — 0.5
- Blowers and tanks rinsed between uses — 0.5
- Refrigerators clean — 0.5

17. BACTERICIDAL TREATMENT OF EQUIPMENT: Approved — 2.0

18. STORAGE OF EQUIPMENT:
- Treated equipment properly stored — 1.5

19. SOURCE OF SHELLFISH:
- Approved — *

20. SHELL STOCK COOLING:
- Refrigerated or protected as necessary — 1.0

21. SHUCKING SHELLFISH:
- Wash water from approved source (See item 9)
- Shell stock free of mud — 1.0
- Bluff not returned — 2.0
- Dip buckets not used — 0.5
- Shucking containers rinsed after each use — 0.5

22. SHELL DISPOSAL: Prompt — 0.5

23. SINGLE-SERVICE CONTAINERS:
- Store rooms clean, no rodents, trash, insects — 1.5
- Kept clean and dry until used — 1.5
- Contaminated containers sanitized or discarded — 1.0

24. PACKING SHUCKED SHELLFISH:
- Shellfish not contaminated during packing — 1.0
- Containers closed as soon as feasible — 1.0
- Clean, properly-designed containers — 0.5
- Containers: identified, Code-dated — 1.0

25. COOLING SHUCKED SHELLFISH:
- Cooled to 45° in 5 hrs — 2.5
- Stored at 45° or less — 2.5
- Frozen and stored at 0° or less — 0.5

26. ICE:
- From approved source; protected from contamination; washed — 1.5

27. RECORDS: Complete, accurate — 1.5

28. PERSONNEL HEALTH:
- Infected persons and carriers excluded — 1.5

29. SUPERVISION: Effective — 3.0

30. CLEANLINESS OF EMPLOYEES:
- Clean aprons or coats; properly stored — 1.0
- Finger cots sanitized; no tobacco used — 0.5
- Packing-room workers wear rubber gloves or wash and disinfect hands — 2.0
- Handwashing by employees — 2.0

SECTION C (SHELL STOCK)

1. WASHING SHELL STOCK:
- Shell stock clean at time of shipment — *
- Wash water from approved source (See item 9)

2. SHIPPING SHELL STOCK:
- Shipping containers clean, identified — *

SECTION D (REPACKING)

1. SHELLFISH FOR REPACKING:
- In approved containers at 45° or less — *

2. REFRIGERATION DURING REPACKING:
- Temperature does not exceed 45° — *
- Frozen shellfish not thawed — *

3. CLEANING OF RETURNABLE CONTAINERS:
- Cleaned soon after emptying — *

REMARKS

DATE

SANITARIAN

*These items not included in computation of initial sanitation rating for Shucker-Packers.

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PHS–769–3
Rev. 5–65

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE

Form Approved:
Budget Bureau No. 68–R633

SHELL STOCK SHIPPER OR RESHIPPER INSPECTION REPORT

PLANT NAME AND LOCATION	CERTIFICATE NO.
	PRODUCT
	NUMBER OF EMPLOYEES

Items not applicable to shipper being inspected should be indicated in appropriate block as "NA"

SECTION A		NA
1. BOATS AND TRUCKS:		
Construction satisfactory	1	
Kept clean, containers clean	1	
Cleaned after relaying operations	1	
3. BODY WASTE DISPOSALS:		
Not discharged in harvesting area	1	
Soil cans—used for purpose intended, secured, proper disposal	1	
SECTION B		
1. WET STORAGE:		
Protected; State Approved	20	
3. SHELL STOCK STORAGE:		
Floors, impervious, graded to drain	2	
Walls, smooth, well-constructed	1	
Conveyances easily-cleanable; clean	1	
Not used as a passageway	1	
Floor drain protected against backflow	1	
9. WATER SUPPLY:		
Safe; adequate quantity	15	
10. PLUMBING AND RELATED FACILITIES:		
Approved; no cross-connections	3	
Lavatories; soap; single-service towels	2	
Handwashing signs posted	1	
Toilet rooms clean; good repair; ventilated; lighted; supply of toilet tissue	2	
Toilet room doors self-closing, tight	1	
No overhead drains	3	
11. SEWAGE DISPOSAL:		
Satisfactory	2	
12. RODENT CONTROL:		
Rodent free; proper construction	2	
Safe use and storage of rodenticides	1	
15. GENERAL CLEANLINESS:		
No miscellaneous equipment or material	2	
No animals, fowls, unauthorized persons	1	

15. GENERAL CLEANLINESS (Cont'd):		NA
Premises clean; no rubbish	1	
19. SOURCE OF SHELLFISH:		
Approved	20	
20. SHELL STOCK COOLING:		
Refrigerated or protected as necessary	2	
25. REFRIGERATION OF SHUCKED SHELLFISH:		
Internal temperature of stored shellfish 45° or less	1	
Frozen shellfish storage 0° or less	1	
27. RECORDS: COMPLETE, ACCURATE	3	
28. PERSONNEL HEALTH:		
Infected persons and carriers excluded	3	
SECTION C		
1. WASHING SHELL STOCK:		
Shell stock clean at time of shipment	1	
Washwater from approved sources (See item 9)		
2. PACKING AND SHIPPING SHELL STOCK:		
Shipping containers clean	1	
Shipments properly identified	1	
SECTION E: (Applies only to reshippers)		
1. SOURCE, (Sec. B, Item 19)	25	
2. REFRIGERATION, (Sec. B, Item 25):		
Internal temperature 45° or less	25	
Frozen shellfish 0° or less	25	
3. RECORDS, (Sec. B, Item 27)	25	

REMARKS

DATE	SANITARIAN

(Sections and item numbers refer to PHS Publication 33, Part II, Rev. 1965)

U.S. GOVERNMENT PRINTING OFFICE : 1965 O—776-724

Appendix B

RECOMMENDED CODE-DATING SYSTEM FOR SHUCKER-PACKERS AND REPACKERS

The following code-dating system is recommended to the States in establishing their code-dating system for shucker-packers and repackers as required by item 24:

A five-digit number and letter system should be established which will reflect the year, the month, the day of the month, and the morning or afternoon in which the shellfish were packed or repacked. Larger packers may wish to indicate morning or afternoon packing by using the letter "A" or "P" in their code system.

Example: 31012
3—1963
10—10th month, October
12—day of month
Example: 40510
4—1964
5—5th month, May
10—day of month

It is further recommended the repackers be required to precede their code-dating digits with the letter "R" to indicate the product is repacked.

Appendix B

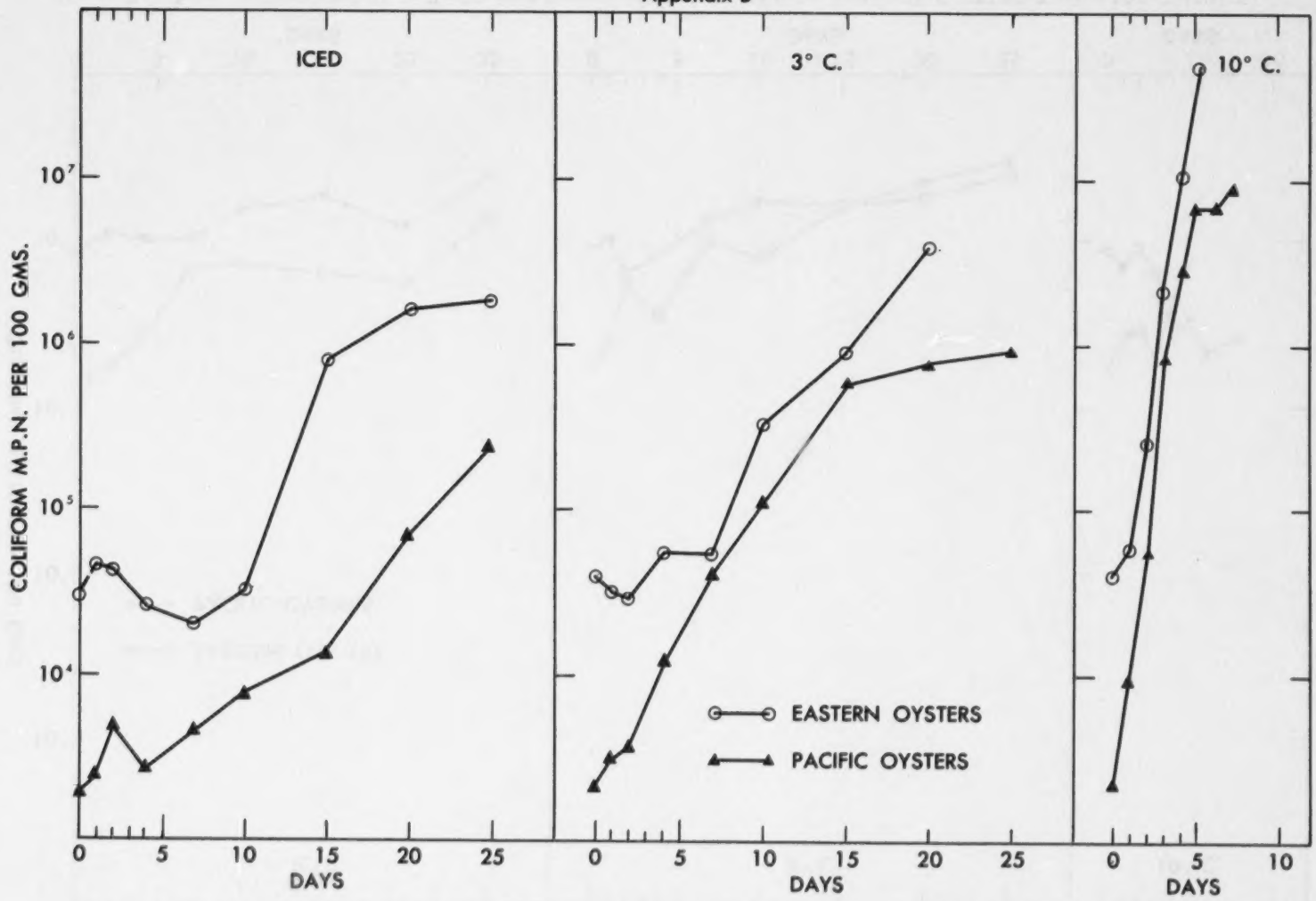


Figure 1. Coliform M.P.N. in Pacific and Eastern Oysters stored in ice and at 3° C. (37.5° F.) and 10° C. (50° F.).

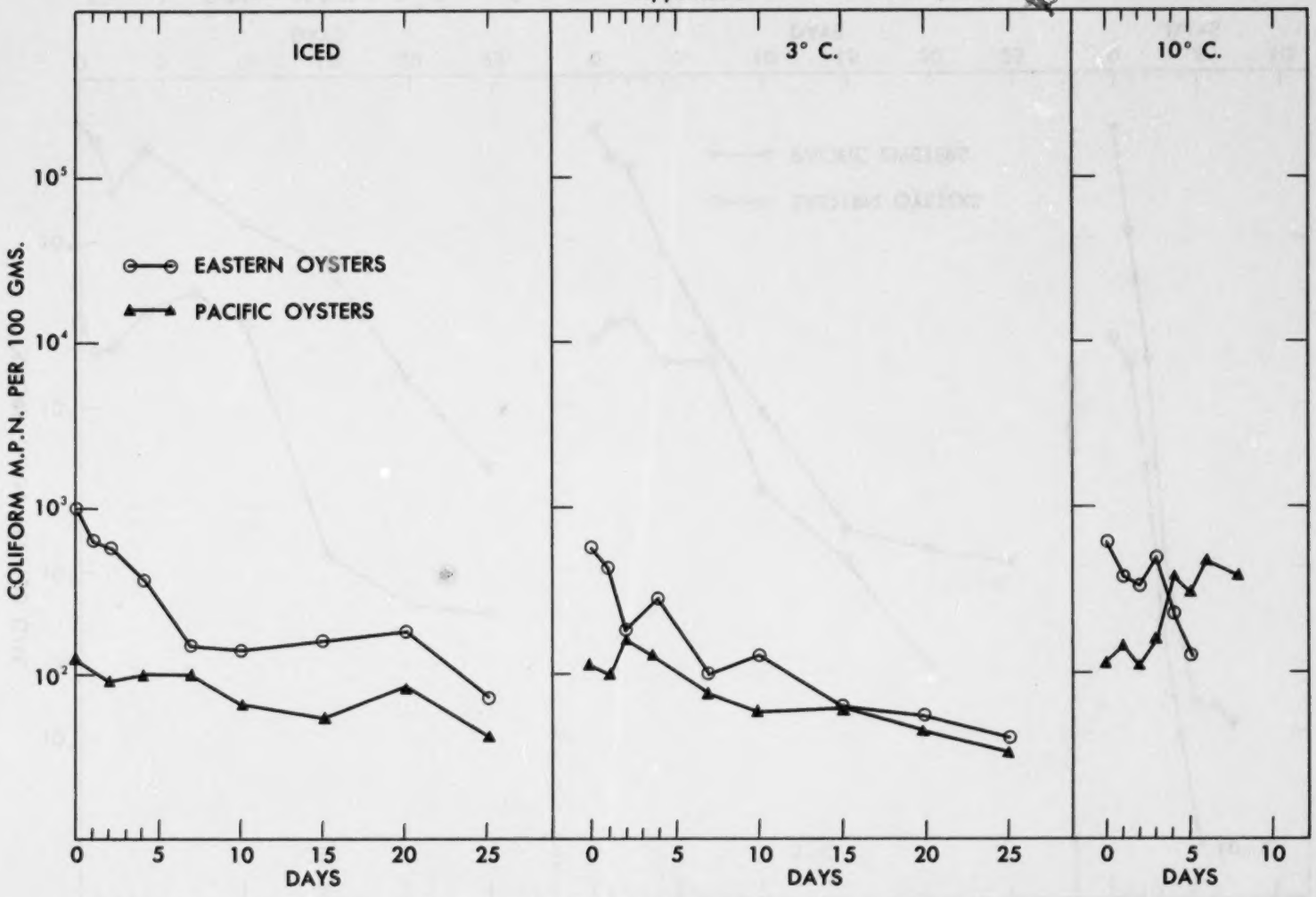


Figure 2. Fecal coliform M.P.N. in Pacific and Eastern oysters stored in ice and at 3° C. (37.5° F.) and 10° C. (50° F.).

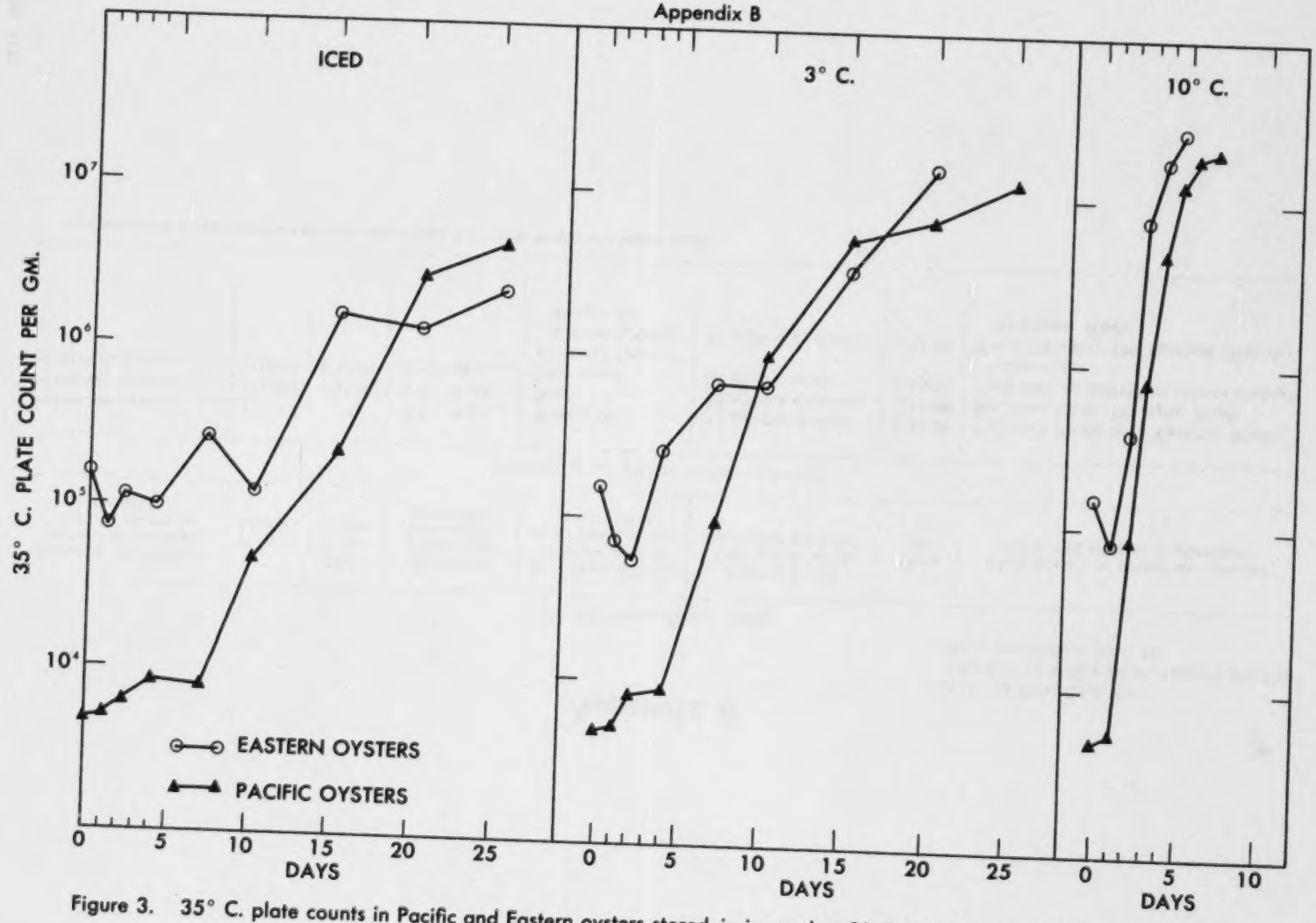


Figure 3. 35° C. plate counts in Pacific and Eastern oysters stored in ice and at 3° C. (37.5° F.) and 10° C. (50° F.).

Appendix B

Name of firm: John Doe
Address: 12 Spring Road, Benton, Florida
State certification No.: 10

Shucker-Packer Ledger Report

Quantity purchased or harvested (indicate oysters, clams, or mussels)	Date of harvest	Date of purchase	State area designation from which harvested	Name and address, or State permit or license number of harvester	Quantity sold (indicate oysters, clams, or mussels)	Date sold	State permit or license number, or name and address of purchaser
(Example of use of form by shucker-packers)							
40 bushels oysters	1/12/66	(*)	WL—Wash.	Wash.—28	40 gallons oysters	1/12/66	Redwood Foods Inc., Tacoma, Wash.
20 bushels oysters	1/14/66	1/15/66	GH—Wash.	Wash.—7	30 gallons oysters	1/15/66	Sea Food Corp., Olympia, Wash.
10 bushels oysters	1/14/66	1/15/66	N—Oreg.	John Jones 12 Shady Lane, Portland, Oreg. Oreg.—12	31 pints oysters	1/15/66	Cash sales to individual buyers through salesroom.
					12 gallons oysters	1/16/66	Toms Grocery, 120 Sentinel Highway, Aberdeen, Wash.

*Date of purchase not applicable since shucker-packer dredged these oysters from his own leased ground.

Appendix B

Name of firm: John Doe
Address: 12 Spring Road, Benton, Florida
State certification No.: Fla.—12
State permit or license No.: 1267

Shell-Stock Shipper Ledger Report

Quantity purchased or harvested (indicate oysters, clams, or mussels)	Date of harvest	Date of purchase	State area designation from which harvested	Name and address, or State permit or license number of harvester	Quantity sold indicate oysters, clams, or mussels)	Date sold	State permit or license number, or name and address of purchaser
(Example of use of form by shell-stock shippers (includes "Buy" boats and "Buy" trucks))							
20 bushels clams	1/2/66	1/3/66	NA—Fla	Fla.—162	5 bushels clams	1/4/66	Fla.—34.
10 bushels oysters	1/3/66	(*)	AB—Fla	Fla.—12	5 bushels clams	1/5/66	Shipped to Wholesale Inc., 40 Maine Ave., Washington, D.C.
5 bushels clams	1/4/66	1/5/66	DF—Fla	John Jones 24 Reo Place Benton, Florida	½ bushel clams	1/5/66	Jane Doe, 7 Maryland Rd., Benton, Fla.
					10 bushels clams	1/6/66	Delmar Restaurant, 101 Riverside Dr., Miami, Fla.
					4 bushels clams	1/6/66	Shipped to Kraften Foods, Inc., 106 Trane Ave., Atlanta, Ga.
					8 bushels oysters	1/6/66	Shipped to Groceries, Inc., 124 Bourbon St., New Orleans, La.
					4½ bushels clams	1/9/66	Destroyed.
					2 bushels oysters	1/10/66	Destroyed.

*Date of purchase not applicable since oysters were tonged by shell-stock dealer Fla.—12 himself from leased ground.

Appendix B

COOLING RATES OF FRESH OYSTERS

Central Laboratory Report*

Object

At the request of the USPHS the rate of cooling fresh oysters was determined on various size cans in crushed ice and under dry refrigeration.

Conclusions

The attached graphs contain the cooling rate curves for 1 gallon (610 x 708), ½ gallon (610 x 314), 1 pint (307 x 314), 12 fl. oz. (307 x 300), and ½ pint (307 x 202) cans cooled in crushed ice and cooled in a dry refrigerated chest. As expected, the cooling rate in crushed ice was faster than in dry refrigeration. Following the inital lag period, the cooling rates were generally the same regardless of initial temperatures.

Procedure

Fresh standard grade oysters were heated in a steam-jacketed kettle to the desired initial temperature and filled into the cans for the first run at each refrigeration condition. In subsequent runs the oysters were warmed in a water or air bath to the desired initial temperature.

The temperatures in the cans were taken with heat penetration thermocouples connected to a potentiometer. The junction of the thermocouple was located at the geometric center of the can.

The first cooling rate determination was made with the cans packed in crushed ice. The cans were covered with ice at all times and a drain carried away the water as the ice thawed. The ice temperature was 31°–32° F.

The second determination was made in a refrigerated chest at a temperature of 31°–32° F. A small fan in the chest kept the air gently circulating.

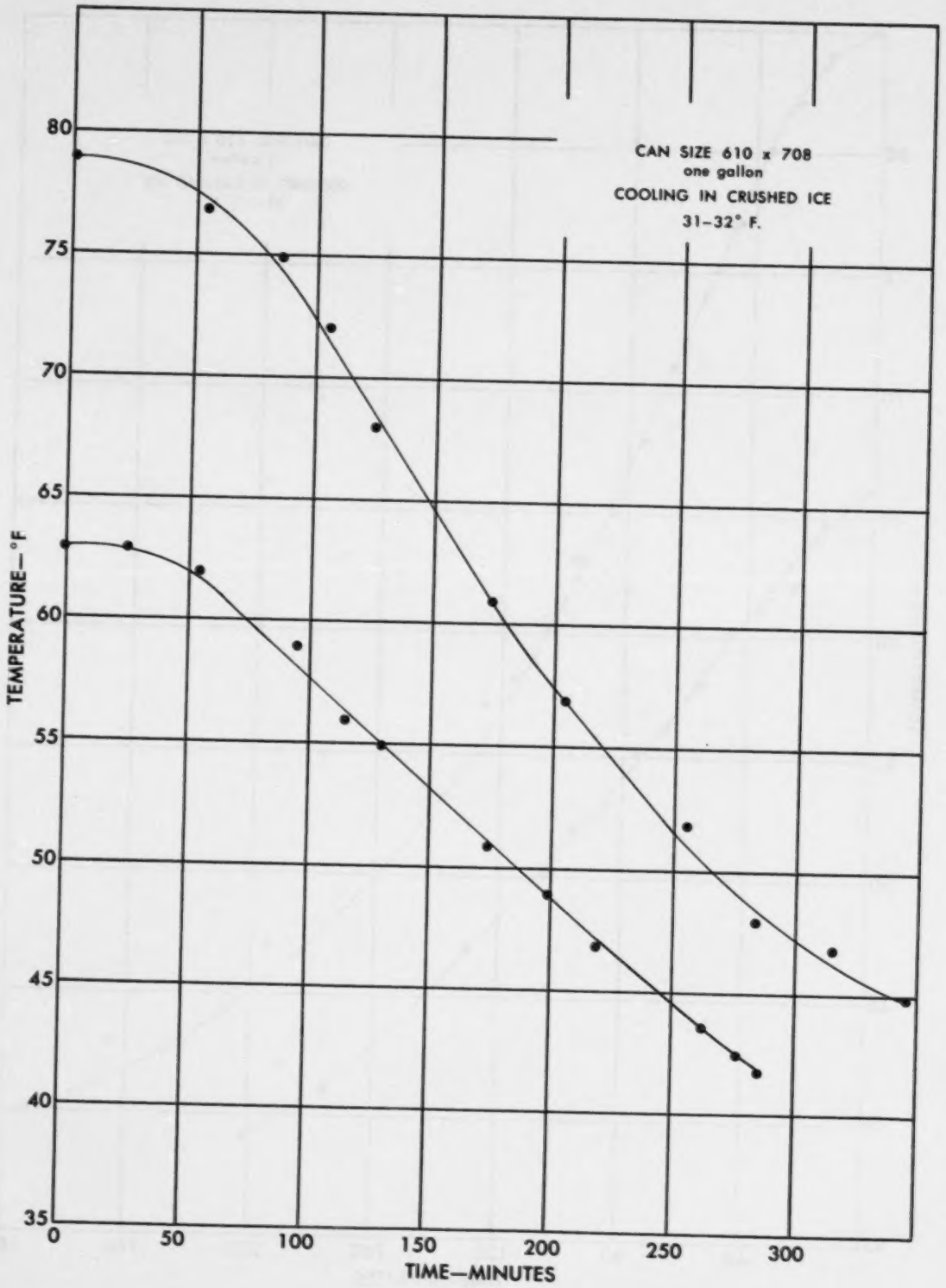
Fresh oysters were used for each refrigeration condition and no deterioration other than some sloughing from physical agitation was noted.

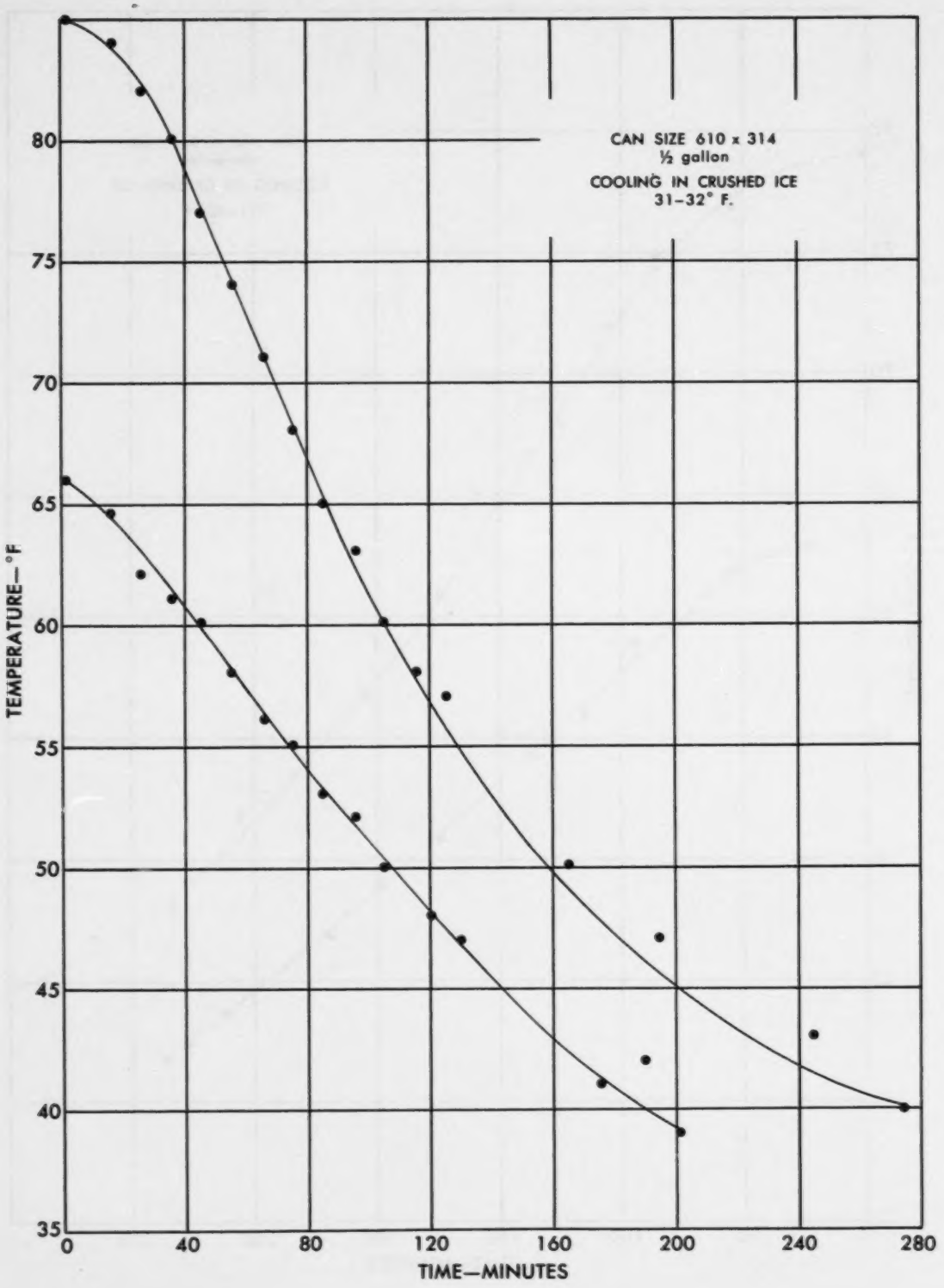
Discussion

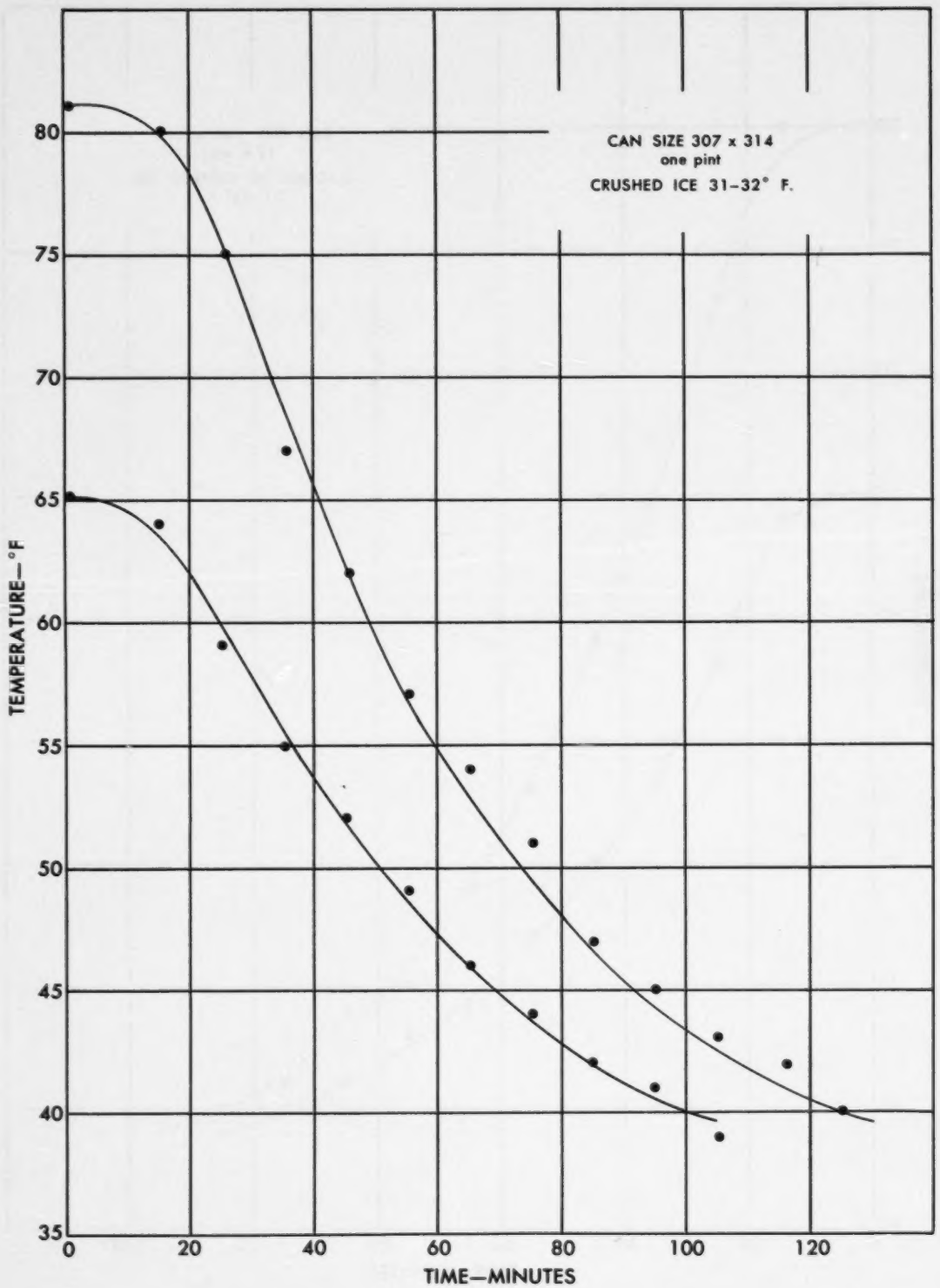
The original request was for cooling rates at initial temperatures of 50° F. increments. We believe that from the attached curves which represent maximum and minimum initial temperatures, the time to cool to any given temperature from any given initial temperature can be interpolated very closely.

D. B. Morden,
Meat, Fish, and Dairy Group.

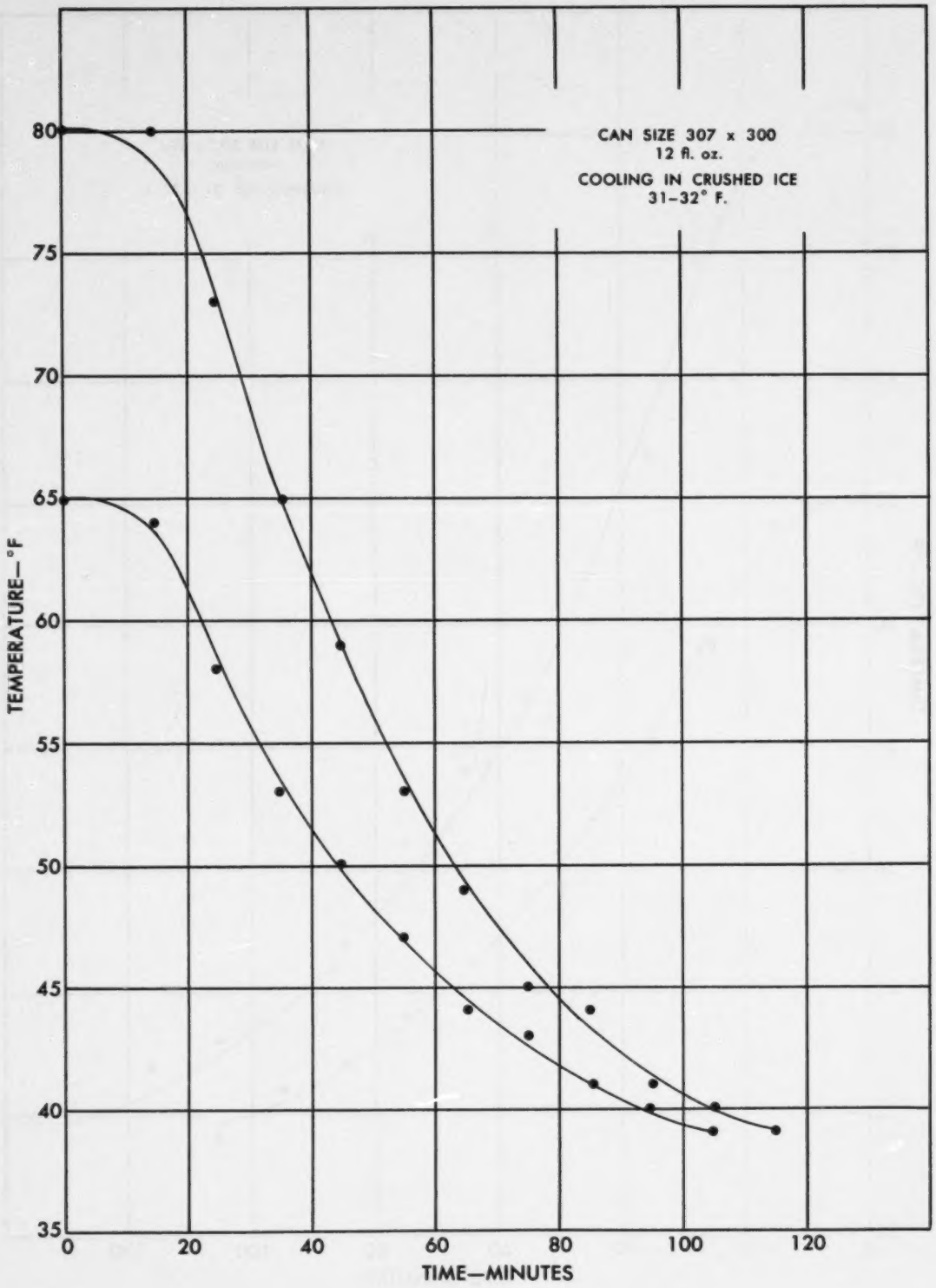
*Prepared by the American Can Company, Technical Service Division at the request of the U.S. Public Health Service.

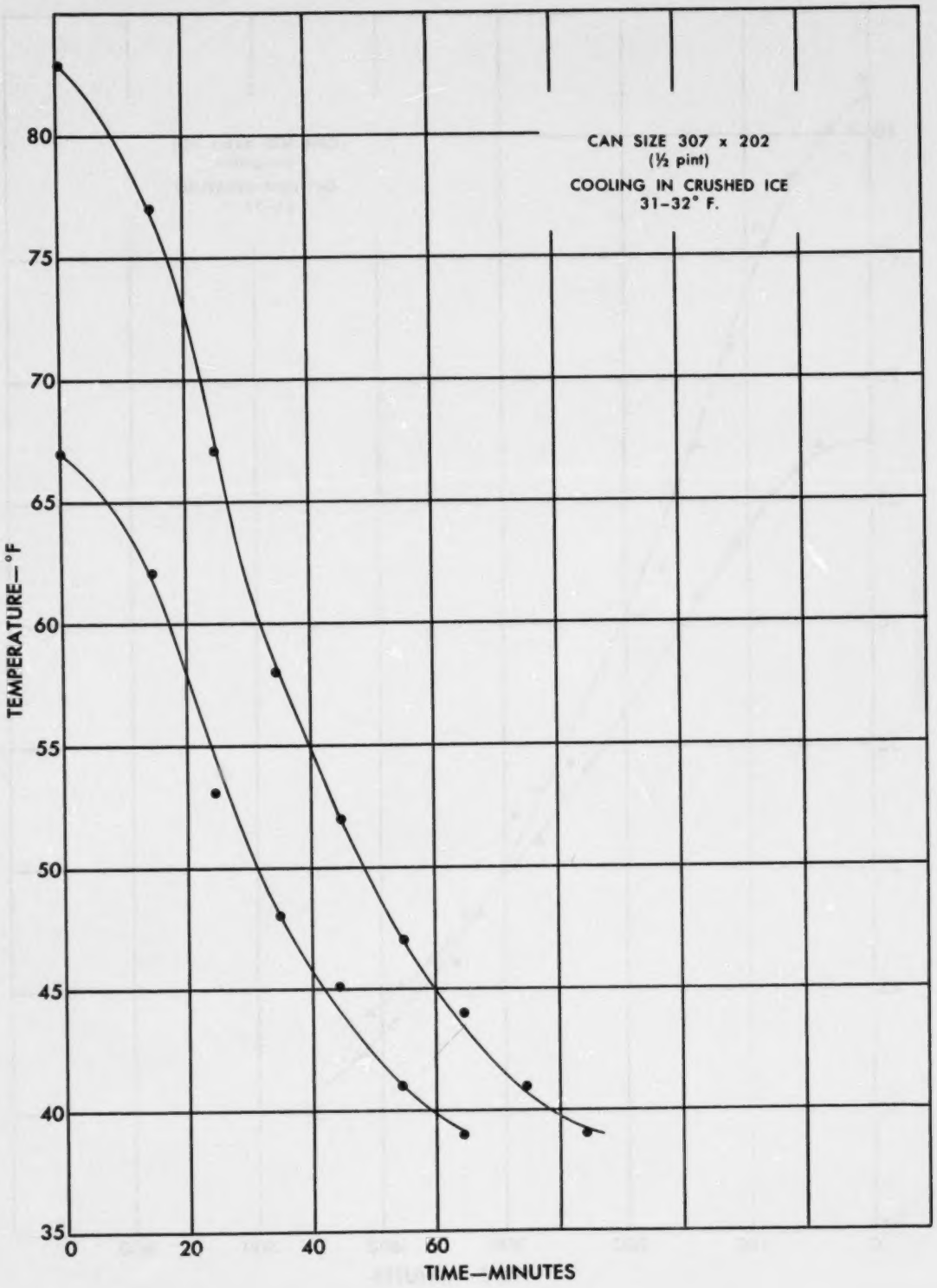

CAN SIZE 610 x 708
one gallon
COOLING IN CRUSHED ICE
31–32° F.
TEMPERATURE—°F
80
75
70
65
60
55
50
45
40
35
0
50
100
150
200
250
300
TIME—MINUTES

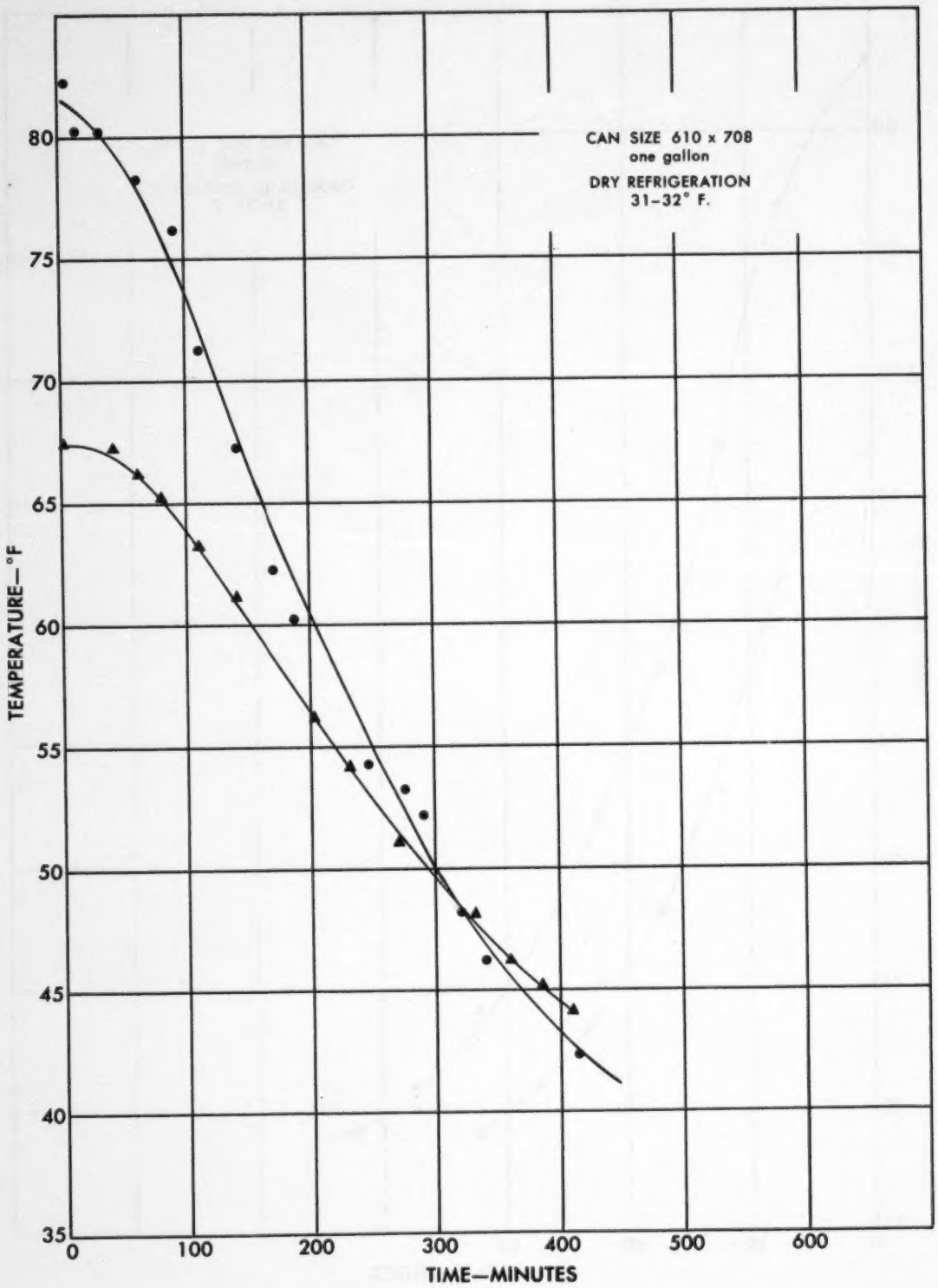

CAN SIZE 610 x 314
½ gallon
COOLING IN CRUSHED ICE
31–32° F.
TEMPERATURE—°F
80
75
70
65
60
55
50
45
40
35
0
40
80
120
160
200
240
280
TIME—MINUTES

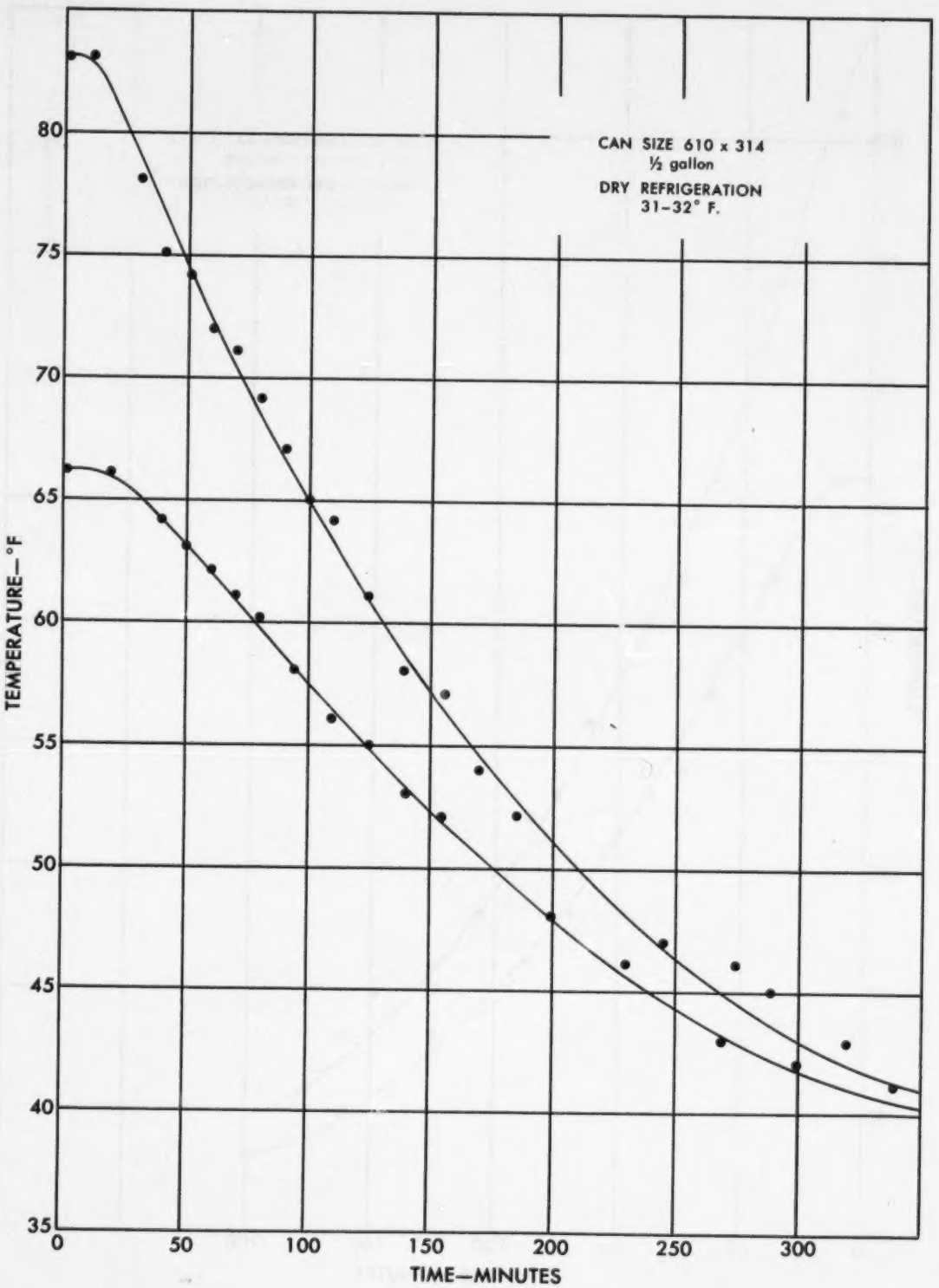

CAN SIZE 307 x 314
one pint
CRUSHED ICE 31–32° F.
TEMPERATURE—°F
80
75
70
65
60
55
50
45
40
35
0
20
40
60
80
100
120
TIME—MINUTES

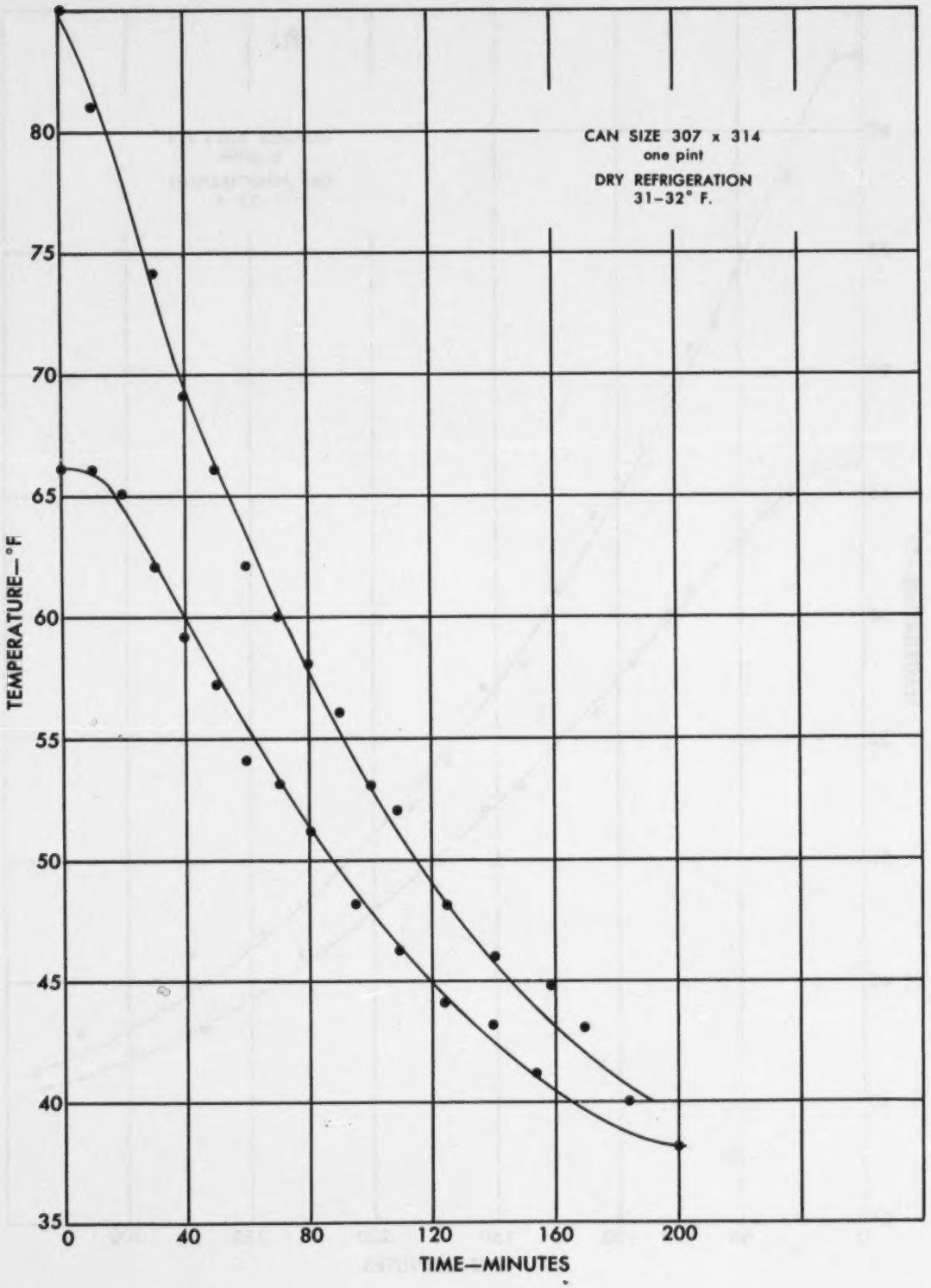
776-722 O - 65 - 4

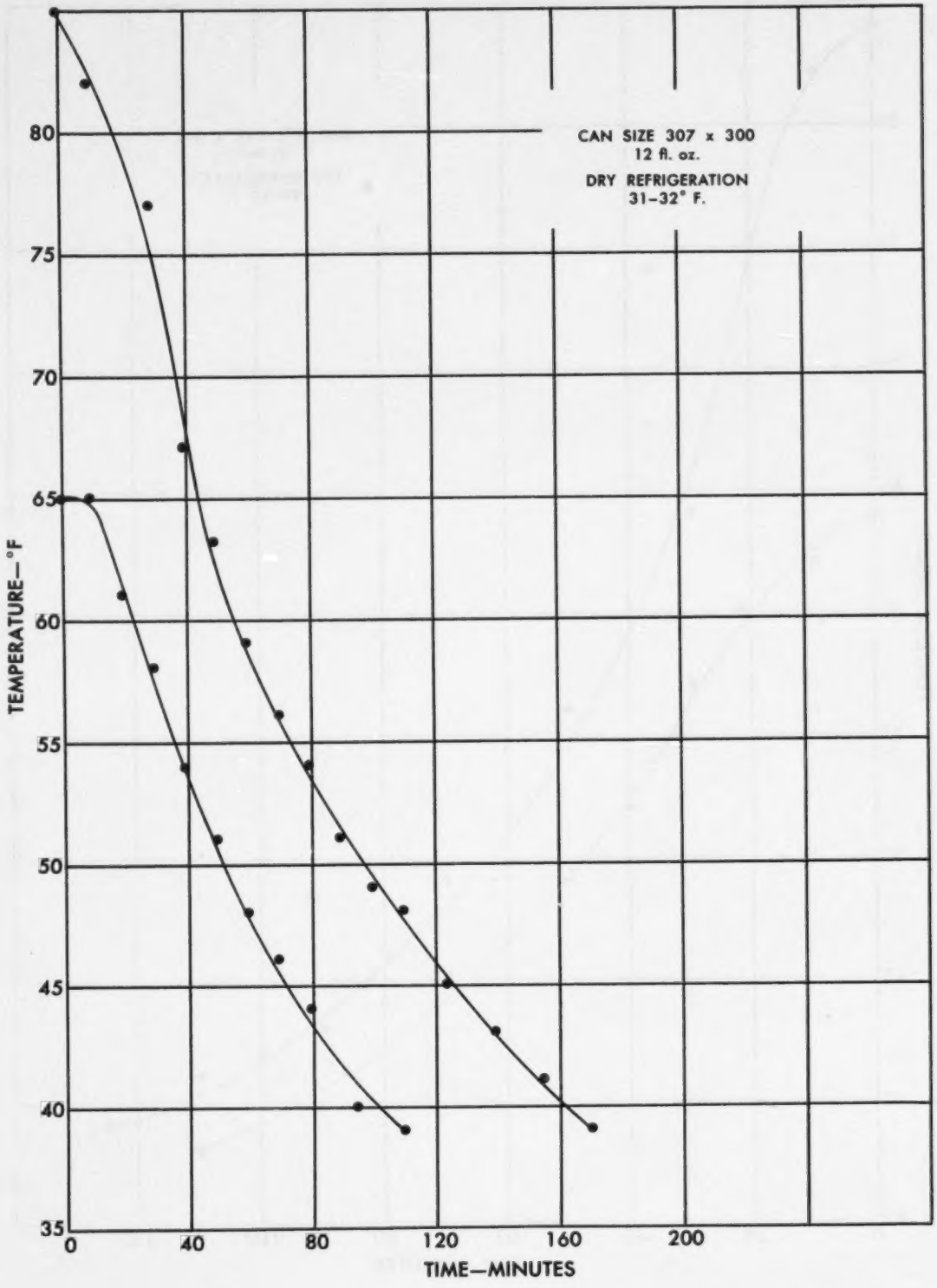

CAN SIZE 307 x 300
12 fl. oz.
COOLING IN CRUSHED ICE
31–32° F.
TEMPERATURE—°F
80
75
70
65
60
55
50
45
40
35
0
20
40
60
80
100
120
TIME—MINUTES

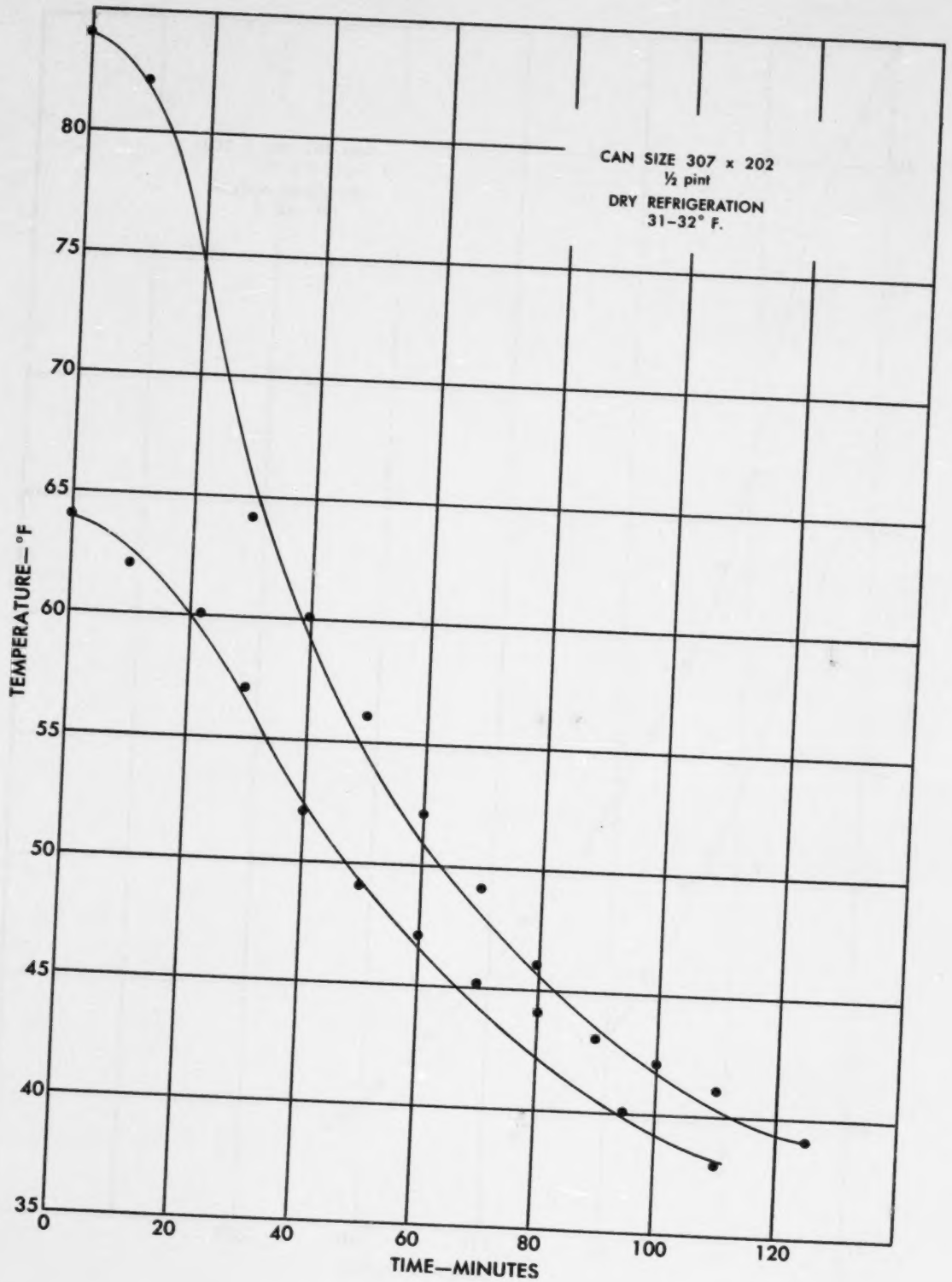

CAN SIZE 307 x 202
(½ pint)
COOLING IN CRUSHED ICE
31–32° F.
TEMPERATURE—°F
80
75
70
65
60
55
50
45
40
35
0
20
40
60
TIME—MINUTES


CAN SIZE 610 x 708
one gallon
DRY REFRIGERATION
31–32° F.
TEMPERATURE—°F
80
75
70
65
60
55
50
45
40
35
0
100
200
300
400
500
600
TIME—MINUTES


CAN SIZE 610 x 314
½ gallon
DRY REFRIGERATION
31–32° F.
TEMPERATURE—°F
80
75
70
65
60
55
50
45
40
35
0
50
100
150
200
250
300
TIME—MINUTES


CAN SIZE 307 x 314
one pint
DRY REFRIGERATION
31–32° F.
TEMPERATURE—°F
80
75
70
65
60
55
50
45
40
35
0
40
80
120
160
200
TIME—MINUTES


CAN SIZE 307 x 300
12 fl. oz.
DRY REFRIGERATION
31–32° F.
TEMPERATURE—°F
80
75
70
65
60
55
50
45
40
35
0
40
80
120
160
200
TIME—MINUTES


CAN SIZE 307 x 202
½ pint
DRY REFRIGERATION
31–32° F.
TEMPERATURE—°F
80
75
70
65
60
55
50
45
40
35
0
20
40
60
80
100
120
TIME—MINUTES

Appendix C

HEAT SHOCK METHOD OF PREPARATION OF OYSTERS FOR SHUCKING

The Eastern oyster *Crassostrea virginica* in some areas is found in clusters which prevents rapid or conventional shucking as with the same species in other oyster growing areas. This natural phenomena has presented questions as to how best this natural resource might be utilized as a food source and remain within economic possibilities.

Dr. A. D. Tennant [1] in Canada investigated the short-term dipping of soft shell clams in near boiling water for various periods of 3 to 30 seconds. It was reported that this short-term heat shock resulted in a reduction of coliform and fecal streptococci numbers. The reduction obtained after 3 to 10 seconds' immersion was not significantly less than that recorded after longer periods of heat treatment with the animals still alive after the immersion. There was no significant increase in the MPN values in "shocked" clam meats during 7-day refrigeration periods, and the short period of immersion did not impair the keeping qualities of the packed, refrigerated clam meats. The "shocking" process also reduced the amount of surface contamination carried to the shucking tables by the shell-stock and facilitated shucking without effecting the palatability of the product.

It has further been found that immersing the cluster-type oyster in comparatively hot water (145°–150° F.) for a short period of time (up to 3½ minutes) facilitates the removal of oyster meat up to 99 percent of that contained in the cluster. This process has been investigated under a cooperative project by the Public Health Service and the South Carolina State Board of Health.[2] The "heat shock" process resulted in an overall reduction in the coliform and fecal coliform MPN's at all percentile levels. The greatest reduction occurred in the samples examined immediately after shocking. Holding on the shucking bench appears to result in a slight increase in these two groups of bacterial indices as compared to oysters examined immediately after shocking; however, these levels remain significantly lower than the levels obtained on samples from the cold shucking process. Accordingly, it has been concluded that with application of sanitary precautions the beneficial use of this food source may be fully realized.

The following sanitary measures are delineated for use where the "heat shock" method of preparation of oysters for shucking is permitted by State shellfish sanitation authorities. These are intended to apply only to the cluster-type oyster, but may be adaptable to other species in other areas.

1. Washing of Shell-Stock.—Shell-stock subjected to the heat shock process shall be washed immediately prior to the heat shock operation in potable water. Experience has shown that wash water temperatures between 65° F. and 75° F. are effective for adequately washing shell-stock. Shell-stock shall be protected from contamination prior to and during the prewash cycle.

Public-health explanation.—Although Item 2 of section A requires that shell-stock be washed reasonably free of bottom sediments and detritus as soon after harvesting as is practicable, it is necessary to again wash shell-stock immediately prior to heat shocking to reduce the bac-

[1] Tennant, A. D. "An Investigation of the Bacterial Flora of the Soft Shell Clam (*Mya arenaria*) in New Brunswick and Nova Scotia." Master of Science Thesis, McGill University, Montreal. Abstract available from Shellfish Sanitation Branch, Division of Environmental Engineering and Food Protection, Public Health Service, Department of Health, Education, and Welfare, Washington, D.C., 20201.

[2] Russell, Ralph T. Hammerstrom, R. J., Pringle, Somers B., and Walsh, Martin. "Studies of the 'Heat Shock' Process for Oysters." See Proceedings Shellfish Sanitation Workshop. Nov. 17–19, 1964.

terial load in the dipping tank. Invariably some mud or detritus will adhere to the shell-stock; hence, the necessity to again wash the shell-stock before it is immersed in the heat shock water where the mud or detritus may be released by the warmer water. The cleaner the shell-stock, the more rapidly the oysters will arrive at the optimum temperature for shucking and there will be less variation in heat transfer among different lots.

Satisfactory compliance.—This item will be satisfied when—

a. All shell-stock subjected to the heat shock process are washed immediately prior to the heat shock operation in flowing potable water. Water temperatures not less than 65° F. nor more than 75° F. are recommended.

b. Shell-stock are handled in a manner which prevents their contamination during the prewash cycle.

2. Temperature and Change of Dip Water.—During the heat shock process the water shall be maintained at not less than 145° F. or more than 150° F. The water shall be completely drained or removed from the heat shock tank at least once each 3-hour period. An accurate [4] indicating or recording thermometer shall be available and used during the heat shock process for temperature measurements. Recording thermometers are recommended so as to provide a record of the temperatures used.

Public-health explanation.—Experience and research indicates the temperature range of 145°–150° F. to be adequate to facilitate removal of oysters from the shell without apparent physical change to the oyster. A temperature range is specified rather than an exact temperature because of varying climatic conditions during the year. Dip water is required to be changed at least every 3 hours to avoid bacterial concentration or build up of mud or detritus.

Satisfactory compliance.—This item will be satisfied when—

a. Heat shock water is maintained at not less than 145° F. or more than 150° F.

b. The heat shock watertank is completely flushed at 3-hour intervals or less in such manner that all mud and detritus remaining in the dip tank from previous dippings is eliminated.

c. An indicating or recording thermometer, accurate within 2° between 145° F. and 150° F. is available and is located in the heat shock water during all periods of shock operation.

3. Time Interval of Immersion.—Shell-stock subjected to the heat shock process shall not be immersed in the heat shock water for periods longer than 3.0 minutes. An accurate timing device shall be available and used to control the time of immersion. Only approved containers of ½-bushel [5] capacity shall be used in the heat shock process. It is recommended that an automatic timer or an automatically electrically controlled timer be used.

Public-health explanation.—Industry practice and investigation reveals that an immersion time varying between 2 and 3 minutes is all that is necessary to facilitate the shucking process. A maximum time of immersion is specified to prevent any physical change in the oyster which would prevent it from being classified as a fresh product. The maximum time specified is based on the use of ½-bushel quantities of shell-stock in ½-bushel wire baskets or other ½-bushel containers approved by the shellfish sanitation control agency.

Satisfactory compliance.—This item will be satisfied when—

a. Shell-stock is not subjected to the heat shock process for periods longer than 3 minutes.

b. An accurate timing device is available and used to control the time of immersion.

c. Only approved containers of ½-bushel capacity are used during the heat shock process.

4. Dip Tank Volume.—At least 8 gallons of heat shock water shall be maintained in the dip tank for each ½-bushel container of shell-stock being heat shocked.

Public-health explanation.—The minimum of 8 gallons of dip water per ½ bushel is necessary to prevent bacterial buildup and extreme variations of temperature in the heat shock water.

Satisfactory compliance.—This item will be satisfied when there are at least 8 gallons of heat shock water in the heat shock tank for each ½-bushel container of shell-stock undergoing the heat shock process.

[4] Thermometers should be accurate to within 2° F.; should have scale divisions not greater than 2° F.; and should be so installed as to be easily read. Accuracy of thermometer should be checked at least once each year by the State regulatory agency.

[5] Defined as 1,075.2 cubic inches or as one-half the U.S. standard bushel of 2,150.4 cubic inches.

5. Cooling of Heat Shocked Shell-Stock.—On removal from the shock immersion water, all heat shocked shell-stock shall be subjected to an immediate cooldown with potable tap water. Heat shocked shell-stock shall be handled in a manner which prevents contamination reaching the shell-stock during the cooling operation.

Public-health explanation.—After undergoing the heat shock process, the internal temperature of the oyster meat was elevated to temperatures within a range of 98° F. to 110° F. in field studies and 116°–147° F. in laboratory studies. It is therefore necessary to reduce the internal temperatures of the oyster meat immediately to prevent bacterial growth, but not to the extent that the purpose of the process is nullified.

Satisfactory compliance.—This item will be satisfied when—

a. All heat shocked shell-stock are subjected to cooling with potable tap water immediately upon removal from heat shock process water.

b. All heat shocked shell-stock are handled in such manner as to preclude contamination during the cooling process.

6. Refrigeration of Shocked Shucked Shellfish.—The oyster meats from all shell-stock which have been subjected to the heat shock process shall be cooled to an internal temperature of 45° F. within 2 hours after the heat shocking process.

Public-health explanation.—Oyster meat temperatures of shell-stock which have been subjected to the heat shock process are higher than those of conventionally shucked oysters. Therefore, it is necessary that such meats be cooled quickly to 45° F. after the heat shock process to deter bacterial growth.

Satisfactory compliance.—This item will be satisfied when all oyster meats of shell-stock which have been subjected to the heat shock process are cooled to at least 45° F. within 2 hours after the heat shock process and are placed in storage at 45° F. or below. (This requirement will require the use of ice in the shucking containers, blowers, skimming tables, or wash tanks, or the use of refrigerated water, wherein the meats will be in direct contact with crushed or flaked ice, or with refrigerated water.)

7. Records of Heat Shock Time and Temperatures.—Each plant operating the heat shock process shall maintain an accurate daily record, on a ledger form satisfactory to the State supervisory agency, of the time and temperature of immersion of at least three lots of shellfish during each day of operation as well as recording the time of change of heat shock water. It is preferable that records show the time of day each recorded lot is immersed and the time of day each recorded lot is removed from the water, and that the individual recordings be at intervals of 2 or 3 hours. These records shall be preserved for at least 3 months for the information of the supervising State agency.

Public-health explanation.—Records are needed to maintain a summary or abbreviated history of each hot dip operation. They are of assistance to the supervisory agency in determining whether the operation is carried out in accordance with these or other State regulations covering the process. They are also of assistance to the operator in maintaining the process within the limitations imposed by State authorities.

Satisfactory compliance.—This item will be satisfied when—

a. Each operator maintains an accurate daily record of the time and temperature of immersion of at least three lots of shellfish during the day of operation and records the time of change of heat shock water. This record shall be on ledger forms satisfactory to the State supervisory agency. (Plants using recording thermometers will be deemed in compliance with this item if suitable indication is made on the chart when the shell-stock are first immersed and when they are removed from the heat shock water, as well as the time of change of heat shock water.)

b. The above records are preserved and are on file at the plant for inspection by State authorities.

8. Cleaning and Bactericidal Treatment of Heat Shock Process Tank.—At the close of each day's operation the heat shock tank shall be completely emptied of all water, mud, and detritus, and shall be cleaned in accordance with the requirements for cleaning of equipment established by item 16, section B, part II. Prior to the start of the next day's operation, the heat shock tank shall be given bactericidal treatment

in accordance with the requirements of item 17, section B, part II. Heat shock process tanks shall be of such construction that they may be easily cleaned.

Public-health explanation.—If the water, mud, and detritus were allowed to remain in the heat shock tank under declining temperature conditions, it would constitute an excellent medium for growth of bacteria. Emptying the tank and cleaning it at the close of the day's operation will more likely insure that the next day's dipping operation will start under optimum conditions of cleanliness. Bactericidal treatment prior to the start of the next day's operation will insure destruction of any pathogenic bacteria remaining after the cleaning operation or introduced during the interim storage period. It will also prevent carryover of thermophillic or thermoduric bacteria from the previous day's operation.

Satisfactory compliance.—This item will be satisfied when—

a. The heat shock process tank is thoroughly cleaned at the close of each day's operation in accordance with the requirements for cleaning of equipment established by item 16, section B, part II.

b. The heat shock process tank is flushed with water from an approved source after cleaning and is allowed to drain and dry overnight.

c. Bactericidal treatment complying with the requirements of item 17, section B, part II, is provided the heat shock tank prior to the start of the day's dipping operation.

d. All heat shock process tanks are of such construction that they may be easily cleaned.

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